SUSTAINABILITY IN EGG PRODUCTION

Improving sustainability in Thai and Dutch egg production. Exploring management interventions

Anke Dijkstra

Van Hall Larenstein, Leeuwarden

Student number: 8010

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Title page

Anke Dijkstra

(281263) (8010)

anke.dijkstra@student.stenden.com

International Business and Management Studies

Specialisation: International Sustainability Management

Under supervision of:

Ruwan Berculo

ruwan.berculo@vnuexhibitions.com

Jaarbeurs

Jaarbeursplein

3521 AL Utrecht

Jerke de Vries

jerke.devries@hvhl.nl

Van Hall Larenstein

Agora 1

8934 CJ Leeuwarden

22-08-2016

Preface

The key challenge of this research is the sustainability in the poultry industry. As an International Business and Management Studies (IBMS) student it is hard to focus on one market since the study gives students such a broad view. Therefore, the poultry industry is something new and different to discover. It will give some new perspectives and ideas about egg production. Next to that, a fresh mind could give new ideas and 'solutions' to the market. During the research several interviews with experts in the field were planned in order to gain knowledge and a questionnaire was send out. Besides, in literature an extensive research was carried out as well.

The final paper serves as graduation project for the study IBMS and specialisation which is conducted by a fourth year student. The subject of this project is sustainability in poultry farming. This report is conducted under the guidance of Mr. Jerke de Vries, Mr. Dethmer Boels and Mr. Ruwan Berculo, which I would thank for their help and knowledge.

Besides, I would like to thank all the farmers, scientists and experts in the field who have helped me during my extensive field research.

Consequently I am satisfied with the content of this report and I hope that you as a reader will enjoy reading this report.

Anke Dijkstra

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Executive summary

Since sustainability is becoming important in every sector, the poultry sector has great concerns as well. The definition of sustainability applied in this thesis is: “The degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources”. In order to concretise, this research is looking at the sustainability at the egg producing farms in the Netherlands and Thailand. This research is assigned by VIV, Vakbeurs Intensieve Veehouderij, which means exhibition in innovative intensive livestock farming. They want to conduct management interventions from this research in order to review the future steps towards sustainability in tradeshows and congresses. The aim of this research was to inform VIV what is going on in the market and where their congresses potentially should focus on.

The Netherlands is chosen due to their leading position in this sector. Thailand is chosen as comparison due to their rising egg consumption. Those two countries are also chosen in order to review two total different approaches, the emotional approach in the Netherlands and the more rational approach in Thailand.

For this research the poultry farmers are approached via the database of VIV Europe 2014 and VIV Asia 2015. They have received a mailing electronically with a link to the questions. The active response rate seems very low and also the reliability of this research is not considered as very high. This could be caused by the fact that people are not very willing to fill in online surveys. Another reason could be the power distant culture, especially in Thailand, which causes lower response rates.

The responded Thai egg producers are two times as big as the responded Dutch egg producers, whereby the Thai egg producers have also more employees. The respondents are especially layer farmers, however, broiler farmers could also be of importance due to their equal concerns with regards to sustainability. Besides, the Thai farmers have more closed system, whereas the Netherlands has more divided between open and closed.

For the Dutch poultry farmers food safety, animal welfare, CO_2 emission and use of antibiotics are most important with regards to sustainability and for that reason it is considered as bearable. They rank themselves 3.6 out of 5 for those three factors above named.

For the Thai poultry farmers food safety, animal welfare and revenue generated are the three most important things when obtaining sustainability. Therefore the Thai poultry farming industry is considered as viable. They rank their self 4 out of 5 for those three given indicators.

To conclude, for the future, the Dutch respondents, determined a ‘Beter leven’ hallmark certification, placing solar panels and stop using (preventive) antibiotics could contribute to sustainability at the egg producing farms.

For the future, the Thai respondents determined Department of Livestock Development (DLD) certification, stopping (preventive) use of antibiotics could and a manure collecting system in order to prevent salmonella infections could contribute to sustainability at the egg producing farms.

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1. Introduction

1.1 The company

The research is assigned by the Dutch company Jaarbeurs. The student is directly connected to the international team of Jaarbeurs, which operates under the name VIV. VIV stands for "Vakbeurs Intensieve Veehouderij", which literally means "exhibition intensive animal husbandry" in English. VIV is part of the Jaarbeurs Utrecht in the Netherlands, internationally VIV is also known as part of VNU exhibitions Europe. VIV organises tradeshows/exhibitions and congresses worldwide. The international exhibitions are in Europe (Utrecht), the Middle East (Abu Dhabi) and Asia (Bangkok). Some of the exhibitions, organised by VIV, are based on the domestic markets, those exhibitions are based in Russia and China. During the exhibitions VIV is also facilitating congresses on several hot topics in the market. Besides those congresses a new congress concept is set up; the poultry summit which took place in Utrecht, the Netherlands and will take place in Buenos Aires, Argentina in October 25-27, 2016.

With regards to the Poultry Summits taking place this year, VIV has done research amongst the potential visitors of the summits, whereby was asked in what they are interested and what could be valuable topics to listen to during conferences. The outcome of this research reviewed as top 3 is antibiotic resistance number one, avian influenza is second and third place is sustainability. Antibiotic resistance and avian influenza are both part of sustainability. However, VIV wants to know more about sustainability in general and for the future organisation of summits and/or conferences it is useful to know the developments in the industry is with regards to sustainability.

Therefore, the relevance for VIV is to gain more knowledge about the attitude of farmers towards sustainability. The industry is changing and this research could determine which future steps they can take towards the content to highlight during congresses. VIV wants to know what is going on in the market about sustainability, therefore this research gives VIV information towards sustainability in poultry farming for the future.

1.2 Topic of research

Nowadays sustainability is becoming more important for companies and consumers. Sustainability means: "The degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources", according the Oxford English Dictionary.

One of the sectors which has great concern in terms of sustainability is the poultry sector, especially the egg production. Since eggs need to be produced in a more organic manner nowadays in consumer perspective. Organic means in this context a large set of rules that need to be followed, such as no use of artificial fertilizers and pesticides with regards to animal feed, a longer life for chickens, (almost)

no medicines use, especially no antibiotics, and more space to live for chickens (European Union, 2007). However, this is not considered efficient when looking at land use, use of equipment and resources (Tuomisto, Hodge, Riordan, & Macdonald, 2012). For example, according the calculation in appendix 2, organic egg production leads to 1860 eggs produced per m2 per year (5.37*10E-4 m^2 per egg per year), whereas 'traditional' production leads to 2880 eggs per m2 per year (3.47*10E-4 m^2 per egg per year) (Bio+, 2016). Thus conventional produced eggs lead to 1000 eggs per year per m^2 more compared to organic produced eggs. Nevertheless, there are benefits about organic producing, since it gives more attention to growth, living conditions and no chemicals are used during the process (Voedingscentrum, 2016).

The industry is changing and two different ways of producing eggs can be distinguished; the approach of North-West Europe and Asia. In North-West Europe, consumers think that a free-range life for the chickens is sustainable. Different parties are promoting this approach, such as Wakker Dier. The activists, such as Wakker Dier, are already known under 85% of the inhabitants and their income has increased by 10% (Wakker Dier, 2016). When looking at the approach of the Eastern part of the world, Asia especially, people think that sustainability is more based on food safety (Tseng, 2012).
The research is about the sustainability in the poultry industry with a focus on chickens, especially layers, since it is the largest part of the industry. The industry is a very broad term, so within this research is focused on the poultry farming, so where the animals live and the eggs are produced. Due to the early stage in the supply chain of the poultry farms, it might make a difference, because the choices of the farmer influences the whole supply chain.

1.3 Stakeholders

The following groups are determined as direct stakeholders and most relevant:

- Poultry farming companies, where the production of the egg is taking place
- Poultry feed companies
- Poultry processing companies
- Government
- Visitors of VIV congresses

In order to decide how to approach the stakeholders, appendix 1 is used. Hereby the stakeholders are assessed based on low-high importance, low-high influence and whether to give them low priority, protect them, monitor them or keep a good relation.

In the figure below is reviewed a very simplified supply chain. This supply chain shows why poultry feed, farming and processing companies are stakeholders. They all have their influence on the end

product, eggs, and have interactions. The exhibitors/clients of VIV in the poultry segment can be categorised in those three categories as well.

FIGURE 1 SIMPLIFIED SUPPLY CHAIN

The upstream companies, such as animal feed, have low influence on the sustainability at a poultry farm, when considering the three P's, and are also not important when improving sustainability. Therefore the upstream companies should have low priority.

The primary production of eggs, which takes place at the poultry farm, has great influence and great importance towards the sustainability at a poultry farm, since it is all about the egg producers. Therefore there should be a good relation between the primary production companies.

The downstream companies, such as the egg processing companies, have high influence and low importance on the sustainability in poultry farming. Processing companies demand a certain quality, with other words they directly affect the chicken farm if they don't buy the eggs due to quality issues Therefore they should be monitored.

The fourth stakeholder group is the government. They have great influence in terms of rules and regulations, they are responsible for the law. Via that way, they have high influence and are of high importance. Therefore it is assessed that the government should be hold a good relation.

The last direct stakeholder group is the visitors of VIV's congresses, because it is organised for them and needs to be valuable for them. For that reason they have big influence on the success of the conferences. However, they have low influence and importance on the sustainability at the poultry farm. Therefore it is assessed that the visitors should have low priority.

1.4 Egg production in the Netherlands and Thailand

In poultry farming, chicken meat and eggs predominates the poultry sector due to the relatively cheap manner to produce proteins and in terms of religion everybody is allowed to eat it (Brugler, 2016). For this research, the focus is on layers, so eggs, because the egg production is transparent and are already activities taking place with regards to sustainability.

A poultry farm is where domesticated birds are raised. The research is about the sustainability in poultry farming, so the place where the chickens produce eggs. The following activities take place at a poultry farm:

- Preparation of the chicken house before arrival of the chicks
- Feeding chickens
- Monitoring the temperature, humidity, air quality and other inside conditions of the chicken house
- Monitoring the feed and water lines in order to be sure that the chicks are provided with plenty of fresh water and chicken feed.
- Checking the health of the chickens
- The cleaning of chicken houses and/or coops
- Loading chickens onto truck for moving to chicken processing companies (eXtension, 2015)

The following types are distinguished in poultry farming:

- Conventional (closed battery housing)
- Enriched cage farming (closed)
- Free range (partially outside)
- Organic (Berculo, 2016)

North-West Europe and Asia are chosen to compare two different approaches in sustainability, which is very interesting for VIV, since they operate worldwide. North-West Europe and Asia are broad terms and for that reason it is narrowed down to the Netherlands and Thailand. The Netherlands is chosen, because they are one of the most innovative markets and within the poultry industry there are a lot of Dutch leading companies (Dutch Poultry Centre, 2016). Thailand is chosen due to their rising chicken egg consumption, as can be seen on in Figure 2 (Heft-Neal, 2008).

Year	Chicken Meat	Eggs	
		Total (tonnes)	Per Capita (kg/yr)
1970		302,544	8.00
1975		314,573	7.00
1980		332,391	7.00
1985		379,358	7.00
1990		571,003	10.00
1995		597,002	10.00
2000		614,586	10.00
2001		600,739	9.00
2002		639,942	10.00
2003		630,800	10.00
2004		--	--
2005		--	--
2006		--	--

FIGURE 2 DOMESTIC CHICKEN CONSUMPTION IN THAILAND (HEFT-NEAL, 2008)

1.5 Sustainability

The concept triple bottom line is expressing sustainability, according John Elkington, the founder of a British consultancy called SustainAbility. The argument from his side was that companies should consider three separate and different bottom lines. The first is the conventional measure of corporate profit—the "bottom line" of the profit and loss account. Next to profit, is the bottom line of a company's "people account"—a measure whereby it is measured whether the company is operating socially responsible. The last bottom line is the company's "planet" account—a measure of how responsible it has been to the environment. So, the triple bottom line (TBL) consists of three P's: profit, people and planet. It aims to measure the financial, social and environmental performance of the corporation over a period of time (Elkington, 1997).

When considering the three P's, companies should focus on:

- Profitable growth: finding new ways to sustain growth in a world that is changing rapidly, and can seem threatening and uncertain
- Innovation: positively connecting capital and environment reconsidering issues and incentives, and making business a force for good

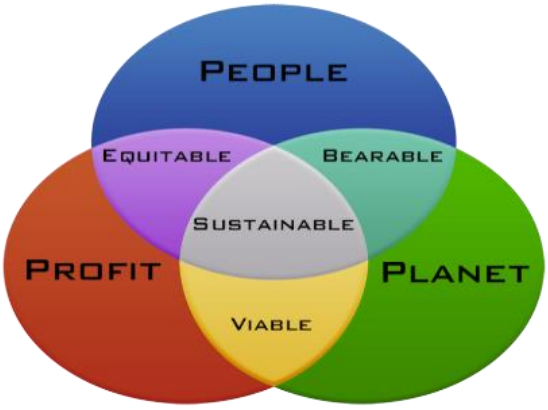

FIGURE 3 RELATION BETWEEN 3 P'S

- Competitive advantage: putting social and environmental impacts at the heart of the business, the basis of more engaging differentiation

- Leadership: inspiring business to be the creators of this new world – to rethink, reframe and reinvent the business for a better future (Fisk, 2010).

In order operationalize sustainability in this study, the book 'The triple bottom line: What is it and how does it work?' is used from Slaper and Hall (2012). The following methods are considered:

1. Monetising all the dimensions of the TBL, including the social and environmental elements. While that would have the benefit of creating a common unit – dollars, for example – it is difficult to find the right price for, say, lost wetlands or endangered prices.
2. Calculating TBL in terms of an index. Examples of indexes that compare a country's performance are the Transparency International Corruption Index, or the Indiana Business Research Centre's Innovation Index. The drawback with indexes is that they are subjective.
3. Using individual indicators and measures where each sustainability measure stands alone. The downside to this approach is that the spreading of measurements could be too broad in order to be relevant (Slaper & Hall, 2011).

The last approach is most often used, however there are no universally accepted standard indicators that cover each of the TBL categories. Nevertheless, this could be an advantage, because it allows adaption to meet the needs of different organisations, projects and geographic boundaries. With these differences driving the decision about what measures to include the TBL score card, however the table below, does provide suggestions (McDonald, 2015).

People (Social)	**Planet (Environmental)**	**Profit (Economic)**
Life expectancy	CO_2 emissions	Revenue generated
Childcare provision	Waste collection	Profit
Maternal and child health	Waste recycling	Tax contribution
Quality of life	Air quality	Personal income
Charitable contributions	Water consumption	Employment
Adoption of innovation	Energy generation	Jobs generated

TABLE 1 COMMON INDICATORS FOR TRIPLE BOTTOM LINE REPORTING (MCDONALD, 2015)

Since the TBL score card has no universally accepted standard indicators, this research contains several indicators above named and additional indicators which are applicable for the poultry industry in the Netherlands and Thailand. The indicators which are used are underlined in table 1.

When referring to people in companies, employees are determined, therefore the farmer's well-being is of importance. The indicator 'quality of life' from table 1 is chosen in order to say something about employee's health. Health issues caused by working at a farm is described for this research, since health

has great influence on quality of life (De Spiegelaere, Closon, & Deboosere, 2011). Local residents of intensive-livestock farming are probably exposed by particular matter, especially specific micro-organisms, dust and endotoxins. Living short distance from the companies, especially when there are more companies based, can this exposure cause bad effects on the health of the local residents and farmer, especially the respiratory tract can be badly influenced (IRAS Universiteit Utrecht, NIVEL, RIVM, 2014). The research is done in the Netherlands, but the assumption is made that it has the same influences in Thailand.

Besides the health of the employees, the health of society is also of big importance. Again the indicator quality of life is chosen, for the same reason as above. One of the influences from an egg to the people's health is a salmonella infection which refers to food safety (Voedingscentrum, 2016). Salmonella infection is caused by the feed and the manure of the chicken (Voedingscentrum, 2016). Since there is no significant difference between Thailand and the Netherlands, the distinction is made between different types of poultry farms. In a closed system, the influence of manure on the eggs is the smallest, since it is collected directly, so hardly no influence of manure on the eggs. By a farm where chickens can go outside, so the types organic and free-range (partially outside), the manure is not collected directly and the egg can be laid on the manure. Therefore the chance of infection is bigger (Simons, Poultry expert, 2016). For that reason, salmonella is taken as indicator for health of the society.

According the ISO 26000 for planet there are three themes; air, water and soil (ISO, 2010). Therefore, the indicators chosen are: CO_2 emission, land use and water use, because in agriculture this plays a big role when referring to impact on the planet (FAO, 2011). The CO_2 emission is described per kilogram (kg) egg, land use is in m^2 per kg egg and water use in m^3 at a poultry farm.

The indicator for profit is revenue generated, since this gives a clear view about the well-being of a company and is hard to influence by the owner/farmer (Wood, 2005). In order to say something about profit, also the costs play their part, so costs are considered as indicator as well. The profit is calculated based on an average poultry farm.

Since chickens are producing the eggs, instead of people in case of an 'ordinary' production plant, the well-being of the animal is of great importance. The eggs are the end product of the production. Therefore, there is a concept added to the three P's, which is Chickens welfare.

For the added concept, Chickens, animal welfare is chosen as measurement, because this gives a very clear view of the well-being of the animals. Animal welfare is a hard indicator to measure since there is not an universally accepted measuring method on that. However, there are parties who have great concerns around this and which are very active, examples in the Netherlands are Wakker Dier (Wakker Dier, 2016), partij van de dieren (Partij van de dieren, 2005) and dierenbescherming

(Dierenbescherming, 2016).

One of the biggest challenges in the poultry industry is the preventive use of antibiotics (AgriHolland, 2011). Besides the chickens do get antibiotics resistant, consumers believe that they can get antibiotic resistant as well (Voedingscentrum, 2014). When the animals are really in need of medicines, antibiotics will not work anymore and the animal might not recover. Therefore is antibiotic use of big importance when talking about animal well-being .

To sum up; for the concept people, the indicators are salmonella and the influence on the farmers health. The indicators CO_2 emission, water use and land use are covered for planet. The indicators of profit are the revenue and costs. For chickens is considered animal welfare and use of antibiotics.

1.6 People, Planet, Profit and Chickens

In the previous chapter is decided on what is going to be measured in terms of the three P's plus chickens, here are the current numbers reviewed.

1.6.1 People

Research shows that health issues are caused by goat and chicken farms. People who are living on and around the farm have more chance to get a pneumonia. Besides people with COPD and asthma have more complications. Exact number are not found yet, but is still researched (Longfonds, 2011).

In the Netherlands are per year 50.000 salmonella infections (RIVM, 2016). For Thailand there are 70.235 registered salmonella infections between 1993-2002. This leads to 7.024 per year on average (Bangtrakulnonth, 2004). For both countries counts that 44,9% is caused by eggs, since this is a worldwide taken average (Nepluvi, 2015).

1.6.2 Planet

To begin with the CO_2 emission of eggs. Compared to other protein productions, eggs produce little CO_2 emission per one kilogram (kg) product. Eggs cause 2 kg CO_2 per kg egg, whereas farmed salmon causes 2,1 kg and the highest cause of CO_2 emissions is beef in Brazil with 30 kg CO_2 per kg meat. The production of milk gives the lowest CO_2 emission with 1,2 kg per kg milk (Blonk & LEI, 2010).

The 2 kg CO_2 per kg egg is an average between the CO_2 emission caused by conventional and organic eggs. Organic eggs cause 2,4 kg CO_2 per kg egg and conventional eggs cause 1,7 kg CO_2 per kg egg (ABN AMRO, 2011). Since there is a lack of specific number for Thailand, it is estimated that those CO_2 emissions count for Thailand and the Netherlands. In Thailand are more closed systems which causes less CO_2 emissions than organic and open systems. Nevertheless due to the lack of innovative

technology in Thailand (especially under the small-holders), lower production, higher feed use, higher mortality rate and worse management, the CO_2 emission is higher in Thailand.

The water use is described in m^3 as an average what is used at a Dutch poultry farm. Table 2 reviews the water consumption on the Dutch poultry farms over the past years.

Water use	2014	2013	2012	2011	2010
M^3	1.410	1.340	1.300	1.121	1.094

TABLE 2 WATER USE PER POULTRY FARMS 2010-2014, THE NETHERLANDS (LEI, 2016)

The water use in the agriculture sector for animal products Thailand is 650 litres per capita, which is 0,65 m^3 daily per capita (Molden, 2007). It is assumed that this amount water is also used in the egg production.

In the Netherlands, land use in m^2 per kg egg is 3,3. For the conventional egg it is 2,9 m^2 per kg egg and the organic eggs need 3,8 m^2 per kg egg (ABN AMRO, 2011). The difference is caused by the large set of regulations in organic farming. The rules in the Netherlands for organic farms is a maximum of 6 animals per m^2, whereas at a conventional farm is the maximum 9 animals per m^2 (Bio+, 2016).

In Thailand the maximum stocking density is actually equal or lower than the new EU standards implemented in 2011, mainly as a consequence of the warm climate in the country and the low costs of housing (WUR & LNV, 2009). Due to the lack of numbers in Thailand, the assumption is made that it will be around 3,3 m^2 per kg egg in Thailand as well, since in this number is considered the conventional and organic approach in the Netherlands. Whereby the density at an organic farm is lower than at a conventional farm.

1.6.3 Profit

In the table below is shown what the profit is per year per hen at a Dutch poultry farm. The revenue includes revenue, accretion (purchase, selling of chickens and change in value livestock) and other revenues. The costs includes feed costs, animal health, energy and other costs.

Profit per hen €	2015	2014	2013	2012	2011	2010
Revenue	18,6	16,2	15,78	21,31	13,35	16,06
Costs	11,7	12,08	13,83	13,37	12,69	10,59
Profit	6,9	4,12	1,95	7,94	0,66	5,48

TABLE 3 PROFIT PER HEN IN €'S THE NETHERLANDS (LEI, 2016)

At an average poultry farm are living 33.000 chickens (CBS, 2010). Therefore the average profit at an Dutch poultry farm was €180.840 in 2010. Within those costs in table 3 is not included the investments and salary of the farmer.

		Small (<10.000)	Large (>10.000)
Average profit	Baht per egg	0,20	0,19
	€ per egg	0,005*	0,0047*

TABLE 4 AVERAGE PROFIT PER EGG THAILAND (FAO, 2002)

* based on the exchange rate: 1 Baht = € 0,025

An average Thai poultry farm has 37.147 animals living on the farm (World Poultry, 2013). According the calculation in appendix 2, the average profit at a Thai poultry farm is €57.650.

According the calculations in appendix 2, in the Netherlands the revenue of eggs is € 0,345 per kg of eggs. In Thailand it is € 0,0784 per kg of eggs.

1.6.4 Chickens

In the Netherlands are several parties who have great concerns with regards to animal welfare. For example Dierenbescherming, which is founder of the 'Beter Leven' hallmark, has invented a measuring system with regards to animal welfare, whereby stars are given from one to three. For this hallmark the following is considered: general, management, transport, nutrition and enrichment, housing, health and interventions, free range (outside) and day room (Dierenbescherming, 2016). The criteria subjects are reviewed in appendix 5. Each criterion is rated for the company. Depending on the rating one, two or three stars are provided with three stars as the highest rating on animal welfare.

In Thailand, the livestock industry is regulated through the Department of Livestock Development (DLD). This organisation has issued a number of standards for animal health, farm management and the environment. The thought behind these standards is to guarantee standards of hygiene, animal welfare and other aspects, and to offer added-value for domestic and international markets (as required by importing countries, especially in Asia and the EU). Since 1999, animal welfare has made its way onto the national agenda, which has resulted in more legalisation. In practice animal welfare has been implemented by the relevant agencies for years but mostly on a voluntary basis. The Farm Standard is based on the "Good Agricultural Practice" (GAP). It covers the appropriate withdrawal times of pharmaceuticals, environment-friendly waste management and follows national and regional disease monitoring (biosafety management) and traceability. Certification by the DLD takes place to ensure product safety and animal welfare standards (WUR & LNV, 2009). Thus, the DLD certification is very general and the animal welfare in Thailand is not as traceable as in the Netherlands.

The use of antibiotics in the Netherlands is shown in the table below. The use in the Netherlands is considered as low (Avined, 2016). DD/DJ stands for animal daily dose per animal year. The definition of first choice is that the antibiotics have no effects with regards to resistance and help for the indication they are given for. Second choice can cause resistance. Third choice is specifically for human

health care. When there are no alternatives, this is used for the animal as well. Details are found in appendix 3.

	2013	2014	2015
DD/DJ egg sector	**1,0**	**1,1**	**1,6**
% first choice	0,5	0,6	0,8
% second choice	0,5	0,5	0,8
% third choice	0,0	0,0	0,0

TABLE 5 ANTIBIOTICS USE EGG SECTOR THE NETHERLANDS (AVINED, 2016)

There are not found specific number about the antibiotic use in Thailand at the poultry farm or livestock farming in general. Therefore the assumption is made that it must be considerably higher than in the Netherlands since Thailand has a warmer climate and more water pollution issues and hence more risk of infection. So the influence of external factors on diseases is much higher than in the Netherlands.

1.7 Management interventions

VIV wants to obtain action points towards sustainability in poultry farming. For that reason is chosen for management interventions as action points. According to the Oxford dictionary, intervention means: “Action taken to improve”. Interventions made on management level is therefore called management interventions.

People, profit, planet and chickens are used as four basis themes, whereby two or three indicators are specified. For every indicator is mentioned a ‘solution’ in order to reduce the impact of the indicator and there is asked to the farmers what intervention they could implement in order to operate more sustainable. A bunch of management interventions could be reviewed in the table on the next page, however, it is limited to one management intervention per theme in order to keep track on the results. Some interventions are based on best practices found via the internet, others are came up via brainstorming.

Indicator	Management interventions
Employee health	Use facemasks when working on the farm in order to prevent issues on the respiratory tract of farmers and employee.
Salmonella	Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.
CO_2 emission	Reducing fossil energy use by placing solar panels on the roof of a farm in order to reduce CO_2 emission on the farm by renewable energy (Agriholland, 2015).
Water use	Keeping the water pressure as low as possible on the water drinking facilities of the chickens, so that the chickens have enough time to drink the water and there is no water spilled (Department Landbouw & Visserij, 2016).
Land use	Reducing land use, by making more floors in the poultry houses.
Revenue	Produce more eggs, when it is needed expand farm, in order to generate more revenue.
Costs	Feed is the biggest cost factor (Wageningen University, 2014), therefore the focus should be on this. The reduction of costs for feed by having another purchasing approach is the management intervention.
Animal welfare	Since, the farms where the chickens have the best life are ranked with three stars with regards to the 'Beter leven' hall mark (Dierenbescherming, 2016), this is used as basis and is considered as ultimate welfare. Specifications are reviewed in appendix 5. The management intervention is: strive to 3 star ranking of the 'Beter leven' hallmark.
Antibiotics	In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.

TABLE 6 MANAGEMENT INTERVENTIONS PER INDICATOR

1.8 Conceptual model

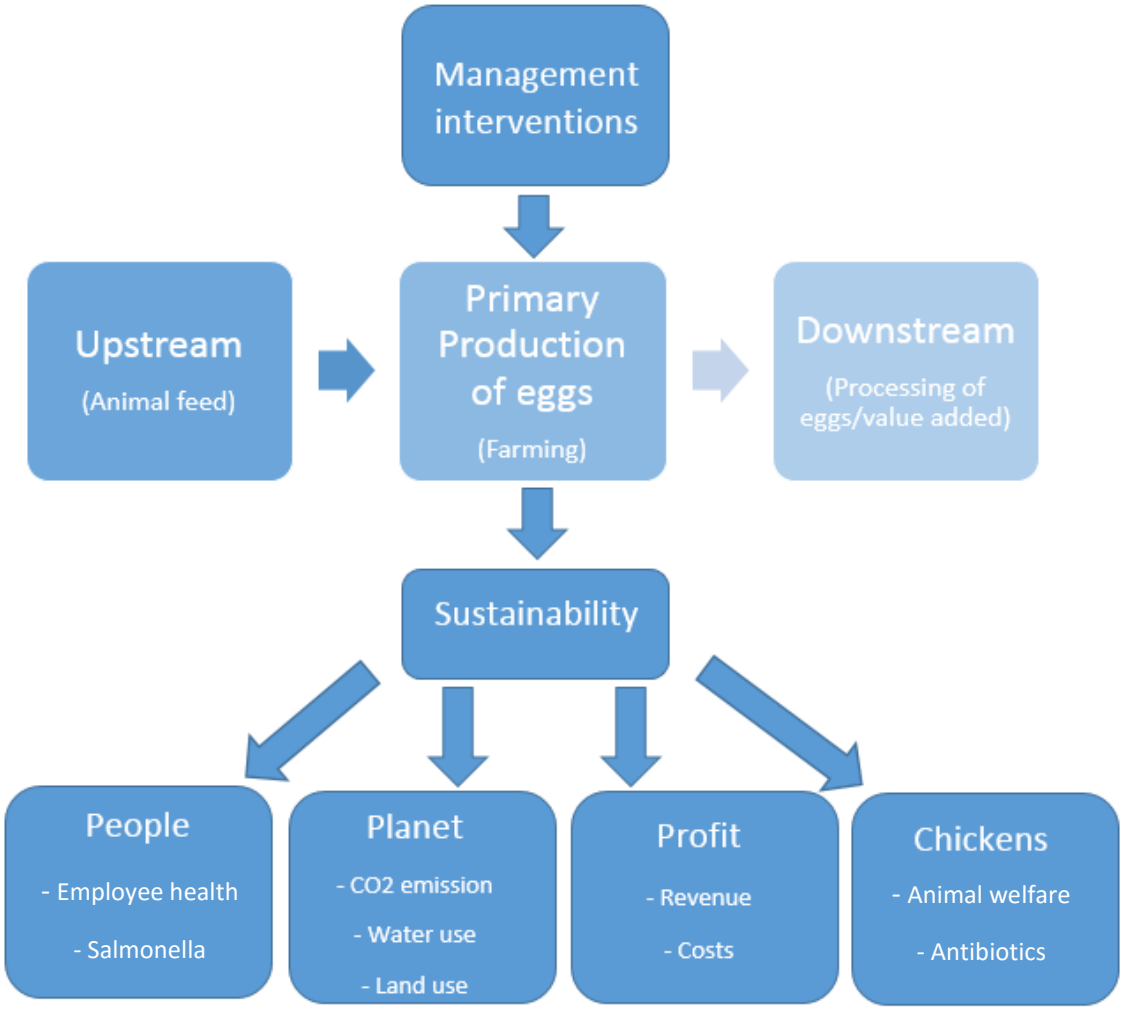

FIGURE 4 CONCEPTUAL MODEL

1.9 Problem definition

VIV is aiming to organize a conference in which the sustainability of poultry farming will be the main focal point. The research is based on the lack of knowledge of VIV, because no specialists in the field of poultry or sustainability are working at VIV. However, VIV currently has limited knowledge on sustainability of poultry farming and therefore is looking for action points towards sustainability in poultry farming. They want to know what is going on in the market worldwide, represented by the Netherlands and Thailand, and how far poultry farmers are with this topic and the interventions that can be done further to improve sustainability.

1.9.1 Objectives

The aim of the research is to provide insight in the overall sustainability issues related to poultry production in the Netherlands and Thailand looking at antibiotic use, health issues employees, water use, land use, CO_2 emission, profit, animal welfare and explore three to five management interventions from the field that VIV can use to further promote overall development of sustainability in egg production worldwide.

1.9.2 Research questions

Due to the several facts explained in the chapter topic of research the main question of this research is going to be: *"Which 3-5 management interventions can be defined from the sector that VIV can use to promote sustainability in the egg production considering the Netherlands and Thailand in the coming 5 years?"*

To answer the main question, the following sub-questions are defined:

- Which alternative interventions can be defined from the sector to further improve sustainability in poultry farming in the Netherlands?
- Which alternative interventions can be defined from the sector to further improve sustainability in poultry farming in Thailand?
- Which interventions with regards to sustainability can be identified and most likely implemented at the poultry farm in the Netherlands?
- Which interventions with regards to sustainability can be identified and most likely be implemented at the poultry farm Thailand?

2. Methodology

In this chapter the research design, data collection and data analyses are discussed.

2.1 Research design

The research is on a combined bases of quantitative and qualitative research, whereby the study design oral history will be used. This is an approach to study perceptions, experiences and accounts of an event or gathering historical knowledge as viewed by individuals (Kumar, 2011).

This research is combined with an internship at VIV and lasted 21 weeks. The research consists of field and desk research. The field research consists of interviews with Dutch experts and a visit to the "Pluimvee museum" in order to gain general information and knowledge. In order to give answers to the main research question and sub questions a survey is send out to the poultry farmers in the Netherlands and in Thailand. In order to reach the Dutch poultry farmers, the database of the visitors of VIV Europe 2014 was contacted. In order to reach the Thai poultry farmers, the database of the visitors of VIV Asia 2015 was consulted. This helps with making three to five action points where VIV is aiming for.

The desk research is mainly research in literature, such as books, researches from other parties, articles found on internet and webpages.

The 'Beter Leven' hallmark is chosen due to their wide range of providers of the hallmark products and with the number of providers is the biggest party (Dierenbescherming, 2015). Taking into account the indicators considered by the 'Beter Leven' hallmark a conclusion is drawn about the farmers care for animal welfare.

2.2 Data collection

This sub-chapter handles the design of the interviews, surveys and ethical issues.

2.2.1 Survey

The survey is translated into Thai, this secures the understanding with the interviewed party.

In order to gain the view of the poultry farmers in the Netherlands, the survey was also be send out to Dutch poultry farmers.

A survey is a written list of questions, the answers to which are recorded by respondents. In a questionnaire respondents read the questions, interpret what is expected and then write down the answers. The only difference between an interview schedule and a questionnaire is that in the former it is the interviewer who asks the questions (and if necessary, explains them) and records the respondent's replies on an interview schedule, and in the latter replies are recorded by the

respondents themselves (Kumar, 2011). So the response is shallow and general. Therefore very concrete questions are asked in the survey and no intentions of VIV or the sector are reviewed in the questions. The questions of the survey can be found in appendix 5.

The survey is send out digitally by email (appendix 5 and 6). It is send out to the database of visitors of VIV Asia 2015 who live in Thailand and VIV Europe in 2014 who live in the Netherlands. By this way, the right people could be reached, since the visitors of VIV exists partially of poultry farmers.

2.2.2 Ethical issues

While doing research, some ethical issues can come across. With interviewing people the following points need to be taken in consideration:

- It is important that procedures for surveys are in writing, and are clearly explained to the potential respondents before interviews proceed. It is expected that interviewees will be supplied with the written version of these procedures.
- The potential respondents have to be happy with the location of the survey, and should be offered alternatives (paper/digital).
- Confidentiality is an important concern. Respondents should not be named (unless their permission has been explicitly sought, and this should only be done where a name is essential for the pursuit of the research in question).
- Permission. Any recorded contribution, in written form, on tape etc., or in notes taken from the survey by the interviewer, should be used in accordance with the wishes of the respondent. If possible, respondents should give their assent in writing and if this is not possible an explanation must be given. If material has to be published or preserved as a public resource, then permission will need to be explicitly given, preferably in writing (Glasgow, 2016).

2.3 Data analyses

After collecting all the data, it is time to analyse the data in order to draw conclusions. For the open question is chosen to approach this by a qualitative manner. Kumar describes 4 steps in 'Research methodology: A step by step guide' in order to analyse data in a qualitative research. The first step is identify the main themes, step two is assign codes to the main themes, step three is classify responses under the main themes and the last and fourth step is integrate themes and responses in to the text of the report (Kumar, 2011).

For the quantitative part is another approach chosen. In order to assess the validity of the results, the active participation rate is calculated. According to Saunders there are two types of response rates:

total and active response rate. The following calculation uses active response rate, which also includes the illegible respondents, who despite of several attempts did not respond.

The calculation is as follows:
Active response rate = total number of responses / [total number in sample – (ineligible + unreachable)] x 100% (Saunders, 2009).

$$n \geq \frac{N \cdot z^2 \cdot p(1 - p)}{z^2 \cdot p(1 - p) + (N - 1) \cdot F^2}$$

In order to be reliable this research needs an active response rate of 180, is 'n', according the formula above (Alles over marktonderzoek, 2016).

For the research in Thailand, the total population of the research exists of the database of VIV Asia, which means that they have visited VIV Asia in 2015. This database is filtered on Thailand, so only people of Thailand receive the survey. Nevertheless, in this group are also farmers from other sectors, investors, interest organisations etc. The group of Thailand exists in total of 8.965, whereby 15% is actually a poultry farmer (Reichgelt, 2016). However, there is not defined in the database who actually is a poultry farmer, 15% is based on VIV's feedback survey after the exhibitions. Besides, there is also no information available whether those farmers are a meat or egg producing farmer. For that reason, the survey is send to the total number of 8.965.

For the research in the Netherlands the same story counts, however, there are different numbers. The total number of Dutch VIV Europe visitors is 5.031, whereby 20% is actually a poultry farmer (Reichgelt, 2016). For the reason that there is no further information available about this number, the survey is send to 5.031 different people.

The difference in numbers between the VIV Asia and VIV Europe is caused by the popularity of the tradeshows as direct cause. VIV Asia is the biggest tradeshow organised by VIV and attracts more visitors than VIV Europe (Berculo, 2016). An indirect cause of this difference might be the size of the companies/farmers. In general, the farmers are bigger in the Netherlands compared to Thailand. Thailand has a couple of huge farmers and a lot small holders. Secondly, with regards to total surface of the Netherlands, there is less space for egg producing poultry farmers, so for that reason the number in farmers is lower in the Netherlands.

3. Research results

First of all are the answer handled per question, details can be found in appendix 6. Also, the answers to the questions are discussed during this chapter. Lastly, the results where layers are compared to the whole poultry farming industry is found in appendix 9.

3.1 Response

The total population for the survey in Thailand was 8.956, whereby 7.816 actually have received the survey (1140 ineligible and unreachable), details in appendix 6. However, 15% of this is actual poultry farmer (Reichgelt, 2016), which is a number of 1172. Those 1172 people are relevant for the survey and were able to answer the questions. 22 Thai poultry farmers responded.

Active response rate: 1,8% (22/1172*100%), which is a very low active response rate.

The total population of the survey in the Netherlands was 5.031, whereby 4.749 have actually received the survey (282 ineligible and unreachable), details in appendix 7. However, 20% of this is actual poultry farmer (Reichgelt, 2016), which is a number of 950 people. Those 950 people are relevant for the survey and are able to answer the questions. 29 Dutch poultry farmers responded.

Active response rate: 3,1% (29/950*100%), which is a low active response rate.

3.2 Answers per question

This research covers data gathering by surveys which are send out electronically. Information is gathered from two countries; Thailand and the Netherlands. The same survey is conducted in both countries. This sub-chapter reviews the results. Details can be found in appendix 8.
Question 1. How many chickens do live on your farm?

	The Netherlands	Thailand
Average	138.380	312.483

TABLE 7 QUESTION 1 OUTCOME (THAILAND N=21, THE NETHERLANDS N=29)

The poultry farms in Thailand are more than 2 times as big as the Dutch poultry farms . The cause of this difference might be the low prices for space and buildings in Thailand and strict rules and regulations when it comes to space in the Netherlands (Simons, 2016). To note, in the Netherlands the internet connection is available for everyone, however, in Thailand this is not the case for the small holders and therefore only the big companies have responded.

Question 2. How many employees work on your farm?

	The Netherlands	Thailand
Average	3	37

TABLE 8 QUESTION 2 OUTCOME (THAILAND N=21, THE NETHERLANDS N=29)

The poultry farms in Thailand have more employees than in the Netherlands. This might be in relation with the outcomes of the first question, since the poultry farms in Thailand have more chickens than the Dutch poultry farms. So there are more activities taking place at a higher frequency in Thailand. Also less automatization and more hand labour cause a higher work intensity. Additionally, the low wages in Thailand also has a big part in this difference.

Question 3. What type of chickens do live on your farm?

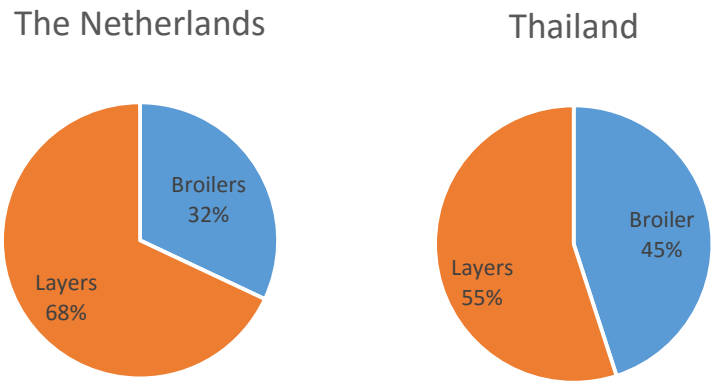

FIGURE 5 QUESTION 3 OUTCOMES

The most responds come from layer farmers, which is very useful for this research, since it focuses on the egg production. However, both farmer types could be considered as valid, since they have same issues with regards to sustainability and holding the same type of animals (Kip in Nederland, 2016).

Question 4. What type of poultry farmer are you?

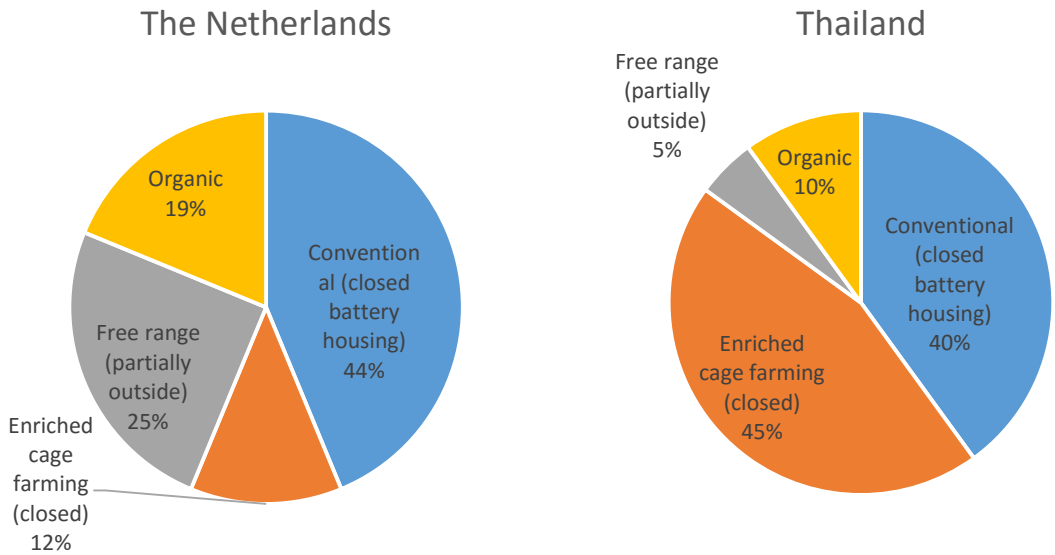

FIGURE 6 QUESTION 4 OUTCOMES (THAILAND N=21, THE NETHERLANDS N=29)

Comparing both countries, Thailand has more closed systems than the Netherlands. Almost all the Thai farms are closed. Only 15% of the respondents have their chickens living (partially) outside. For the Netherlands it is more divided, however, the biggest part exist of conventional farms. The Netherlands counts 44% of the respondents where their chickens are living (partially) outside.

Question 5. What are the three most important indicators when obtaining sustainability at an egg producing farm? (Multiple-choice question with nine different indicators given in the question)

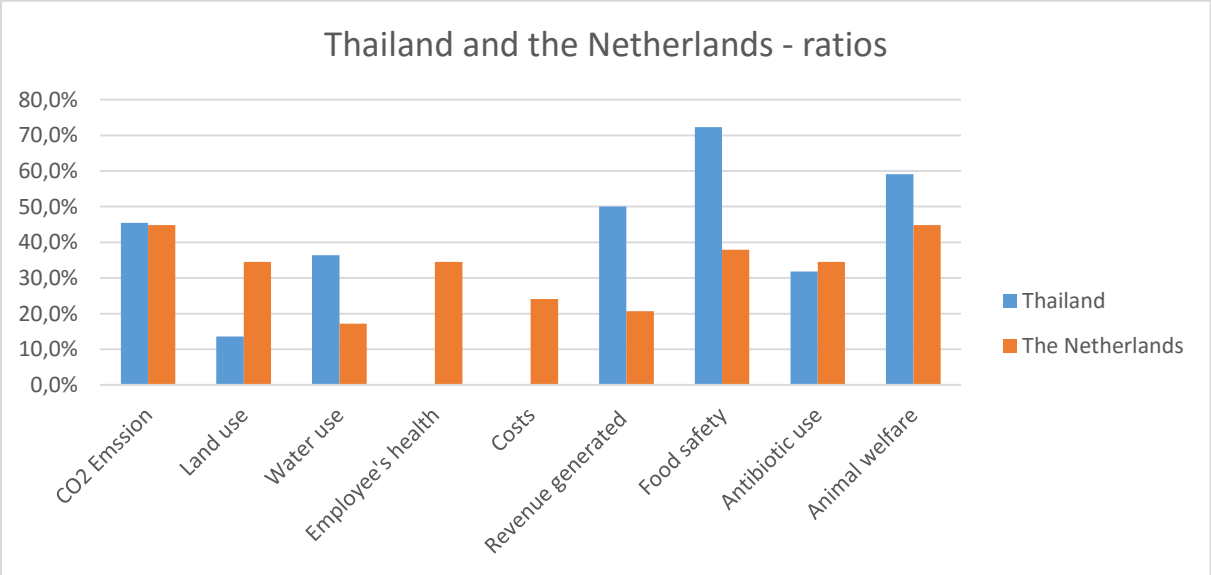

FIGURE 7 QUESTION 5 OUTCOMES (THAILAND N=21, THE NETHERLANDS N=29)

The outcomes of this questions are very different from each other. In the Netherlands the ratios are very divided under the indicators. In Thailand 72,3% of the respondents have answered that food safety is one of the three most important indicators when obtaining sustainability at an egg producing farm. The top three in Thailand are food safety, animal welfare and revenue generated. Another remarkable thing is that costs and employee's health is scored as 0%. No particular reason is found for this, it might be caused by difference in priorities.

In the Netherlands the poultry farmers believe that CO2 emission, animal welfare and food safety are the most important indicators in sustainability in poultry farming. The percentages in the Netherlands are not a lot different from each other, every point named is important for the Dutch poultry farmers, a range in ratios of 17,2%-44,8%. Whereas in Thailand the percentages are differing from 0%-72,3% and food safety is by far number one, which was already mentioned in the first chapters of this report. Animal welfare and CO2 emission are part of the outcome for both countries. Nevertheless, the perception of animal welfare is different in the Netherlands than in Thailand. For Thailand is asked about the DLD certification and for the Netherlands is asked about the 'Beter leven' hallmark. However, those two standards are not from the same level, when looking into the criteria. DLD certification is much easier to reach than the 'Beter leven' hallmark.

Question 6. Taking in consideration the three options you chose above, how would you asses your farm in terms of sustainability? (ranking 1-5)

	The Netherlands	Thailand
Ranking	3,6	4

TABLE 9 QUESTION 6 OUTCOMES (THAILAND N=21, THE NETHERLANDS N=29)

Thai poultry farmers are ranking their selves higher than the poultry farmers in the Netherlands with regards to sustainability. When combining the results of question 5 and 6, Thai poultry farmers rank their self 4/5 with regards to food safety, animal welfare and revenue generated. Dutch poultry farmers rank their self 3,6/5 with regards to CO_2 emission, animal welfare and food safety.

Question 7. What could you do in order to operate more sustainable?

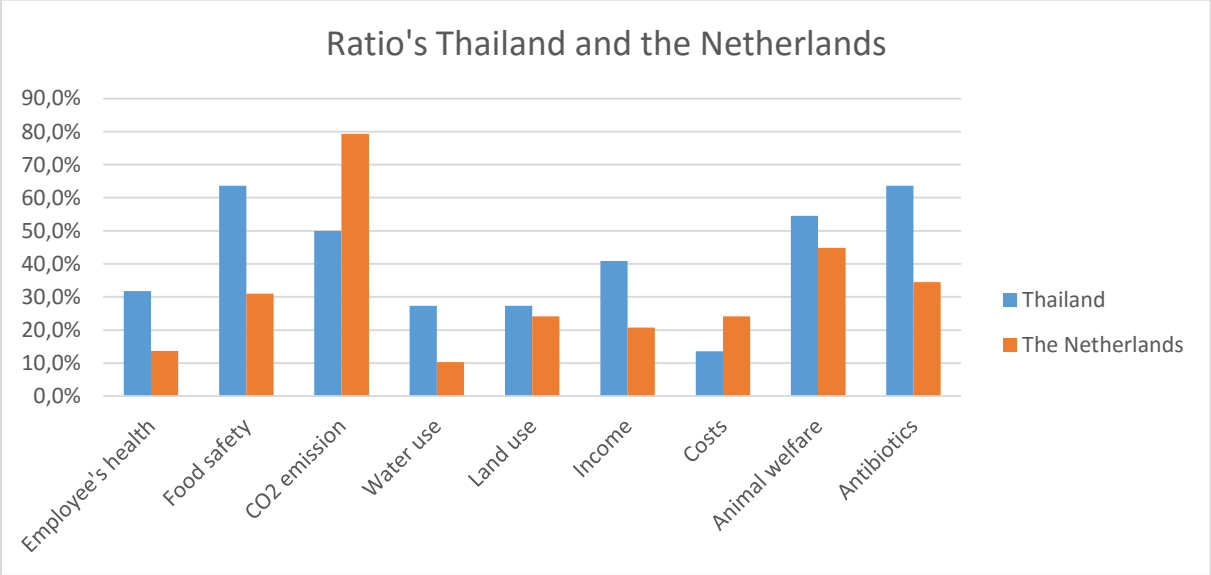

FIGURE 8 QUESTION 7 OUTCOMES (THAILAND N=21, THE NETHERLANDS N=29)

Table 6, gives for each indicator in the figure above a management intervention. In the Netherlands 79,3% of the respondents believe that placing solar panels on the roof of the egg producing farm could contribute to a more sustainable egg production. Next to the solar panels, almost half of the respondents thinks that a better life for the layers, by obtaining a certificate of the 'Beter leven' hallmark, could lead to a more sustainable egg production.

In Thailand the answers differ from each other. Thai farmers believe that stopping (preventive) use of antibiotics, obtaining a DLD certificate with regards to animal welfare, placing solar panels and implementing a manure collecting system could help them in order to operate more sustainable.

Question 8. Describe in one sentence what other interventions, next to above mentioned, you could determine?

The Netherlands	Categories
In my opinion is the feed conversion most important when talking about sustainability	Decreasing cost price
Only for the higher revenue sustainability is possible	-
Openness towards consumer	Transparency towards customers
Back to basic and rethink what we are doing at the moment. Bigger is not always better	Analyse what is done currently
Communicate the fact that per nutrition unit (energy and protein) animal products, especially eggs and poultry meat, are one of the most sustainable products.	Transparency towards customers
To reduce costs for feed and water, produce a sustainable egg	Decrease cost price
Diminish emission of fine dust particles and effect of too much manure on same piece of land.	Fine dust issues
Poultry farmers should save energy, reduce emissions in all kind of sources and produce animal friendly.	Take more care of the environment and more attention for the animals
Smaller amounts of animals at farms, so that they can receive more attention	More attention for the animals
Create a better selling price	Increase selling price
The most important step is to recognise the need of sustainability, afterwards define it clearly and act according it.	Teach farmers about sustainability
Collect data and analyse it	Analyse what is done currently
Improve preventive interventions in order to prevent problems. For example, do not use antibiotics, but pro and/or prebiotics.	Prevent problems with regards to sustainability
Produce what the buyers demand	Market-demand
Fine dust needs to be tackled	Fine dust issues
Food by products use for animal	-
No anonymous, but supply with name of producer	Transparency towards customers
Do not increase production quantity. More regional based cooperation, local work, reducing transport of the eggs. This counts for everything, such as raw materials, feed, end products, manure etc.	Work locally
Everything is named above	-
Replace the soya from South America to another source of protein, such as insects.	Work locally
Going along with the way we are going now. Implement innovative developments and value use on own company, together or as sector.	On the right track at the moment
Increase efficiency through scaling: add companies together to one big company. Hereby will increase the income, decrease the costs and better prices will be arranged for the customers. Eventually invest in improving sustainability.	Cooperation between farmers

TABLE 10 QUESTION 8 OUTCOMES - THE NETHERLANDS (N=29)

The answers given to the question above are varying a lot from each other. Several themes are answered multiple times, such as the fine dust issues, transparency towards customers and show where the product comes from, initiate cooperation between several poultry farmers, work locally. Transparency towards customers and cooperation between poultry farms are answered three times, it is concluded that those two are most favourable to add to the management interventions.

Thailand	**Categories**
Optimized feed	Change feed
Supervision of sanitary	Improve litter in stalls
Balancing both the revenue side, environmental stewardship and community	Balance between people, planet, profit
Balancing both the revenue side, environmental stewardship and community	Balance between people, planet, profit
Sheds should be closed to prevent transmission of the disease, poultry.	Prevent transmission of diseases
Take for your life	-
Hiring local people, it will make people in low income areas and coexist sustainably.	Work locally
Knowing most valuable resource.	Resource management
Production control process quality.	Control quality
Agriculture must look at the way Known materials The economic environment	Balance between people, planet, profit
Care system	-
Waste utilization	Recycling
Poultry should be healthy to have a good yield. The good food Good sanitation managed to reduce the use of antibiotics so that fewer people have safe food to consumers. Currently, the use of manure to make Bio. Gas Respondents environment, it is advised to invest Moi.	Improve litter in stalls
Profitable and sustainable	Balance between people, planet, profit
Cause ecological balance on the farm.	Balance between people, planet, profit
Reducing the environmental impact that results Food safety and antibiotic unless.	Reducing impact on planet
Keeping production costs low and maintaining healthy chickens to produce good continuity.	Reduce cost price and quality continuation
Sharing your profit for interested customer and improve environment.	Transparency towards customers

TABLE 11 QUESTION 8 OUTCOMES – THAILAND (N=22)

The answers given to the question above are varying a lot from each other. Two themes which are answered multiple times are the sanitary for the chicken's manure in the poultry houses and finding the right balance between people, planet and profit, in other words the triple bottom line.

4. Discussion

In order to be reliable this research needed at least 180 respondents. However, only 51 have responded after several attempts, the respond rate for Thailand was 1,8% and for the Netherlands 3,1%. Not even 50% of 180 is reached.

This response rates seem very low. However, according the study from Baruch, Y. and Brooks, H. "Survey response rate levels and trends in organizational research", response rates have decreased in the past years.

This may have many reasons. Studies suggest that web based surveys (such as this one) have low response rates because of security reasons.

Another reason might be cultural differences. In high power distant cultures (as in Thailand) people tend to have greater acceptance towards autocratic relationships and do not give their own personal opinion (Baruch & Brooks, 2008).

It is not possible to say why the response rates are only 1,8% and 3,1%. The reason might be slow internet connection; security concerns or indeed: cultural differences.

In order to gain more respondents in the Netherlands a better timing of the survey should be planned. A lot of direct responds to the mailings said that the interviewees were on annual leave and therefore not reachable. Another reason, could be the lack in data, since it was based on the VIV Europe visitors of 2014. A many times received direct respond was that the person left the company and/or change in email address. This could occur also a low respond rate.

In order to gain more respondents in Thailand the most effective way might be going there and ask the questions directly to the farmers in the language they prefer. In the beginning the questions were only available in Thai language, however, some responds via email said that there are farmers who do not read Thai language, so the questions needed also to be in English online. By this way everybody who was willing to answer the questions was able to answer.

Besides, due to the lack of computer and internet at the small-holders, they could not participate actively in this research. Therefore, only big farmers have mostly answered the questions. However, most often those bigger farmers are visiting VIV events and the small-holders are not able to visit since they have other priorities or no resources for such events.

The research is based on surveys which gives a shallow and general view of the results and opinions of the farmers and therefore the conclusions are also influenced by this fact. In order to gain more in depth information, it might help to interview farmers personally whereby all kind of question could be

asked, since interaction between interviewer and interviewee is made. Also no misunderstandings will occur.

When looking at the proposed methodology in appendix 9, the plan has not very changed with regards to data collecting and analyses.

With regards to the numbers and information given in chapter 2, there are only used scientific resources. For that reason it is considered as reliable. Nevertheless, there is a lack of numbers of facts in Thailand and therefore several assumptions are made. When continuing this research, the lack of information should be filled in. This could be done by somebody who reads and writes Thai language, because maybe there is information available on the internet which not could be found since there is only looked for the information in English.

Since this research is limited in terms of management interventions, further research could give other outcomes. For every theme is considered only one management intervention, nevertheless, a hundred of others could be determined. When all those options are included, the outcome might be different from this research. Besides, trade-offs should be considered between management interventions. For example, the management intervention “Reducing land use, by making more floors in the poultry houses”, might have a disadvantageous effect on the animal welfare in terms of space.

5. Conclusion

Due to the low response rates (1,8% Thailand, 3,1% the Netherlands of the research, it is hard to make evident conclusions and therefore this research is named as exploring. However, it is possible to give directions where the egg producing companies should go in the future in order to operate more sustainable. Therefore this conclusion should be considered as direction. In order to conclude an answer will be given to the main question of this research: *Which 3-5 management interventions can be defined from the sector that VIV can use to promote sustainability in the egg production considering the Netherlands and Thailand in the coming 5 years?* Via the sub-questions:

- Which interventions with regards to sustainability could most likely be implemented at the poultry farm in the Netherlands?
- Which interventions with regards to sustainability could most likely be implemented at the poultry farm Thailand?
- Which alternative interventions can be defined from the sector to further improve sustainability in poultry farming in the Netherlands?
- Which alternative interventions can be defined from the sector to further improve sustainability in poultry farming in Thailand?

In order to gain a view where the egg producing farmers are now, a conclusion will be drawn based. According to the Dutch layer farmers CO_2 emission, food safety, antibiotic use and animal welfare are most important when referring to sustainability.

For the coming 5 years, improving on sustainability the Dutch poultry farmers are most likely willing to place solar panels on the roof of their estate. Next to the solar panels, ceasing (preventive) use of antibiotics, striving for a 'Beter leven' certification and implement a manure collecting system could also be options to improve the sustainability at the farms.

Additional to those given management interventions, the Dutch poultry farmers mentioned actions towards profit, reducing costs and increasing selling price could help with regards to sustainability. Besides, transparency towards customers and work locally could improve sustainability as well.

According the Thai layer farmers revenue generated, food safety and animal welfare are important when obtaining sustainability at a poultry farm. When referring back to the three P's, it could be translated to profit and people. The conclusion can be drawn that the Thai egg producing sector is viable at the moment, when looking to figure 13 on the previous page.

For the coming 5 year, improving on sustainability, the Thai poultry farmers are most likely willing to implement a manure collecting system in order to secure the food safety. Next to that, stopping

(preventive) use of antibiotics and a DLD certification with regards to animal welfare could also help to be more sustainable.

Besides those given management interventions, the Thai poultry farmers came up with some alternative interventions which could be implemented in the future. The most given option was regarding the 3 P's and finding the right balance between those concepts. Next to that, disease prevention, stopping depletion of resources and hygiene are points given for improving sustainability.

In order to sum up and compare the most likely implemented management interventions between Thailand and the Netherlands, the following table is produced with the ratio's reviewed per country:

Management interventions	**NL***	**TH****
Use facemasks when working on the farm in order to prevent issues on the respiratory tract of farmers and employee.	13,7%	31,8%
Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.	31,0%	63,6%
Reducing fossil energy use by placing solar panels on the roof of a farm in order to reduce CO_2 emission on the farm by renewable energy	79,3%	50,0%
Keeping the water pressure as low as possible on the water drinking facilities of the chickens.	10,3%	27,3%
Reducing land use, by making more floors in the poultry houses.	24,1%	27,3%
Produce more eggs, when it is needed expand farm, in order to generate more revenue.	20,7%	40,9%
The reduction of costs for feed by having another purchasing approach.	24,1%	13,6%
Strive to 3 star ranking of the 'Beter leven' hallmark.	44,8%	54,5%
Do not preventively make use of antibiotics.	34,5%	63,6%

TABLE 12 CONCLUSION MANAGEMENT INTERVENTIONS

**NL = the Netherlands*
***TH = Thailand*

The 3-5 management interventions that VIV can promote sustainability in the egg production are:

- Placing solar panels on the roof of the farms (CO_2 emission and energy)
- Implementing a manure collecting system (food safety)
- Stop preventive use of antibiotics (antibiotics)
- Strive for certifications with regards to animal welfare (animal welfare)
- Reducing costs for feed in order to gain more profit (alternative)

6. Recommendations

Besides those five management interventions named in the conclusion, the difference in approach between the Netherlands and Thailand needs to be taken in consideration. The Dutch approach is more emotional based, since they want to take care about the chickens and environment more than profit. The Thai approach is focusing more on the rational side, whereby the food safety and profit is of big importance.

For the Netherlands, VIV should emphasize that profit is also part of sustainability. The Dutch farmers/population only think about the wellbeing of the chickens and the implementation of innovative systems in terms of planet.

For Thailand it is more important to teach about the importance of the people within sustainability. The Thai poultry farmers are believing profit and planet are most important. A great balance between the three P's causes sustainability and that is the most important part which is not fully understood for both countries.

When extending this research, several things need to be kept in mind. One of the most important things is the response rate. In order to gain more respondents in the Netherlands a better timing of the survey should be planned. In order to gain more respondents in Thailand the most effective way might be going there and ask the questions directly to the farmers in the language they prefer.

When continuing this research, the numbers and facts in chapter 2 should be complemented, since some assumptions are made.

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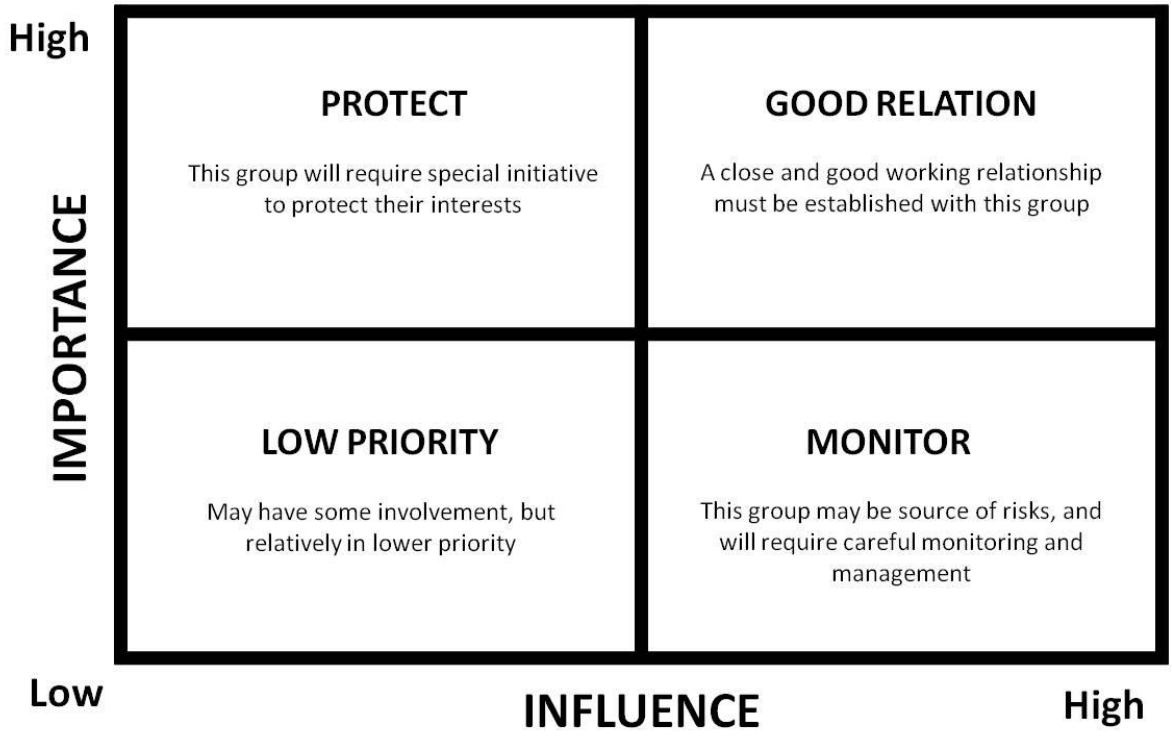
Appendixes

Appendix 1: Stakeholder analyses



Appendix 2: Calculations

Conventional eggs: maximum of 9 animals per m^2 (Bio+, 2016), 320 eggs a year (Simons, Poultry expert, 2016) => 9 chickens*320 eggs = 2880 eggs per year per m^2

Organic eggs: maximum of 6 animals per m^2 (Bio+, 2016), 310 eggs a year (Simons, Poultry expert, 2016) => 6 chickens *310 eggs = 1860 eggs per year per m^2

The average profit at a Thai poultry farm: €0,005 + €0,0047 / 2 = €0,00485 the average profit per egg (FAO, Comparative Profit Performance, 2002) * 320 eggs per year (Simons, Poultry expert, 2016) = 1,552 * 37,147 average amount chickens at Thai farm (World Poultry, 2013) = € 57,650

Calculations price in €'s per kg of egg: 1 Kg is on average 16 eggs. Thailand: 16 * €0,00485 = €0,784. The Netherlands: €6,09 per hen per year / 320 eggs per year per hen = 0,01903 * 16 = €0,345

Appendix 3: Definitions first, second and third choice antibiotics

Indeling	Omschrijving
Eerste keuze	Empirische therapie met antibiotica die werkzaam zijn tegen de indicatie en geen specifiek effect hebben op het voorkomen van resistentie. Het zijn per definitie middelen die geen directe invloed op het voorkomen van extended spectrum beta-lactamases (ESBL) / AmpC producerende organismen en ze kunnen als eerste keuze middelen worden gebruikt.
Tweede keuze	**Nee tenzij**: alleen op basis van gevoeligheid van de verwekker. Dit kan zijn op basis van opgebouwde bedrijfshistorie: t.a.v. voorkomen van resistentie in dierpathogenen, , bacteriologisch onderzoek inclusief ABG uitslagen etc, en moet altijd aantoonbaar ondersteund worden door aanvullend onderzoek.
Derde keuze	dit zijn antibiotica die van kritische belang zijn voor de humane gezondheidszorg. **Nee tenzij:** alleen voor individuele dieren als op basis van bacteriologisch onderzoek inclusief ABG is aangetoond dat er geen alternatieven zijn.
Verboden voor voedselproducerende dieren	dit zijn antibiotica die zijn verboden voor voedselproducerende dieren omdat deze antibiotica niet voorkomen in de bijlage tabel 1 van Verordening (EU) Nr. 37/2010 van de Commissie van 22 december 2009 of in tabel 2 als verboden stof worden aangemerkt.

(Autoriteit diergeneesmiddelen, 2011)

Appendix 4: Criteria subjects 'Beter Leven' hallmark

The 'Beter Leven' hallmark has 3 different levels, star 1 is the least best star and star 3 is the best start which can be obtained.

Star 1	**Star 2**	**Star 3**
General - Existing law - Chain quality systems - Marking and traceability - Different housing systems - Emergency facilities	General - Existing law - Chain quality systems - Marking and traceability - Different housing systems - Emergency facilities	General - Existing law - Chain quality systems - Marking and traceability - Different housing systems - Emergency facilities
Management - Forced moulting	Management - Forced moulting	Management - Forced moulting - Prevention feather pecking
Transport - Catching	Transport - Catching	Transport - Catching
Nutrition and enrichment - Busy and enrichment - Stomach grit - Straw - Nails and beaks barns	Nutrition and enrichment - Busy and enrichment - Stomach grit - Straw - Nails and beaks barns	Nutrition and enrichment - Busy and enrichment - Stomach grit - Straw - Nails and beaks barns
Housing - Housing systems - Entry control - Occupation - Bedding material - Perches - (Day) light - Climate - Covered range	Housing - Housing systems - Entry control - Occupation - Bedding material - Perches - (Day) light - Climate - Covered range	Housing - Housing systems - Entry control - Occupation - Bedding material - Perches - (Day) light - Climate - Covered range
	Free-range - Free-range (partially outside) - Entry control	Free-range - Free-range (partially outside) - Entry control
		Day room - Day room
Health and interventions - Sick-bay (Separate space for sick animals) - Salmonella - Corporate health and welfare plan	Health and interventions - Sick-bay - Salmonella - Corporate health and welfare plan	Health and interventions - Sick-bay - Salmonella - Corporate health and welfare plan

LEGHENNEN

Dierenwelzijnsnormen voor leghennen met 3 sterren: Rondeel

De specifieke normen voor het kenmerk en de benodigde controle voor zover IKB daarin al niet voorziet, staan ook opgenomen.
Niet voor verspreiding. Aan deze criteria kunnen geen rechten worden ontleend. Onjuistheden en aanpassingen voorbehouden.
AH= administratief herstel, HI= herinspectie, schorsing: binnen 3 maanden verbetering aantonen dmv HI, tot die tijd niet produceren met BLK kenmerk, uitsluiting= minimaal 1 jaar uitsluiting van BLK

Versie: 25-10-2012

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
	Algemeen				
	Bestaande wetgeving	Het bedrijf voldoet aan het Legkippenbesluit	LB[1],		
A01	Ketenkwaliteitssysteem	Het bedrijf heeft een IKB of een KAT certificaat.	IKB, KAT	Het bedrijf laat zich jaarlijks controleren op de IKB en/of KAT voorschriften en heeft geen afwijkingen op het gebied van dierenwelzijn.	Uitsluiting
A02	Stempeling en traceerbaarheid	Eieren moeten altijd op het bedrijf worden gestempeld. Ongestempelde eieren mogen niet alsnog in het pakstation worden gestempeld en onder BLK worden verkocht, ook niet bij storing van het stempelapparaat; deze moeten in een ander kanaal worden afgezet.	IKB, KAT (geen uitzonderingen)	Controleer steekproefsgewijs of alle eieren op het bedrijf voorzien zijn van een stempel en dat de stempel goed leesbaar is. Ongestempelde eieren zijn aantoonbaar in andere kanaal dan BLK afgezet. Noteer eventuele afwijkingen.	Schorsing indien printer stuk en/of administratie niet voorhanden en/of bij afwisbare inkt.
	Noodvoorzieningen	Indien mechanische ventilatie: er is een werkende alarminstallatie en een noodstroomaggregaat m.b.t. ventilatie aanwezig. Het noodstroomaggregaat dient elke 2 maanden getest te worden.	AW[2], IKB	Controleer of een alarm en werkend noodstroomaggregaat aanwezig is (aggregaat testen), of de kleppen bij stroomuitval automatisch openvallen, indien	AH niet alle testen geregistreerd HI noodstroom-aggregaat niet

[1] LB = Legkippenbesluit 2003
[2] AW = Algemene Welzijnsrichtlijn: Richtlijn 98/58/EG inzake de bescherming van voor landbouwdoeleinden gehouden dieren

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
		Voor natuurlijk geventileerde stallen is dit niet verplicht.		de stallen niet natuurlijk geventileerd worden. De 2 maandelijkse testen van het noodstroomaggregaat dienen geregistreerd te worden. Noteer laatste 3 data van testen.	voorhanden.
	Management				
M01	Ruien	Geforceerd ruien wordt niet toegepast, aangezien dit gepaard gaat met welzijnsonvriendelijke maatregelen.		Noteer leeftijd van de leghennen in weken.	Schorsing, indien geforceerd ruien aannemelijk lijkt.
M02	Voorkomen verenpikken	Door middel van rustige rassen, een goede opfok, een goede omgang met de kippen en goed management wordt verenpikken en kannibalisme voorkomen.		Betreed de stal en bekijk de bedekking van de kippen met veren. Is er minder sprake van verenpikken dan in gangbare pluimveehouderij? En reageren de kippen rustig bij betreden van de stal? Noteer de bevindingen	
	Transport				
	Vangen	Het vangen van de dieren gebeurt door IKB-PSB erkende vangploegen in blauw licht.	PSB-erkend (IKB)	Controleer of de ingeschakelde vangploeg IKB-PSB erkend is. Noteer naam PSB en datum werkzaamheden.	AH
	Voeding en verrijking				
V01 V02	Bezig houden / omgevingsverrijking	Elke dag wordt 2 gram graan of voer van voldoende diameter (groter dan 1 mm doorsnede) per leghen gestrooid in stal of overdekte uitloop, waarbij de pluimveehouder al strooiend van de stal af loopt de uitloop in.		De pluimveehouder moet graan strooien onder toeziend oog van de controleur. Op die manier kan gecontroleerd worden of de kippen gewend zijn aan graanverstrekking. Noteer naam leverancier.	HI indien te weinig verstrekt, schorsing indien geen graan/voer is verstrekt
V03a V04	maagkiezel	Tenminste elke 2 weken wordt 1 gram maagkiezel (doorsnede 4-6,5 mm) per leghen gestrooid in het dag- en nachtverblijf.		Controleer de aanwezigheid van aankoopbonnen in de administratie en de hoeveelheid nog aanwezig op het bedrijf om vast te stellen dat het gebruikt wordt. Noteer naam van de	

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
				leverancier.	
V05 V06	Stro	Elke maand worden per 6000 kippen 2 strobalen aangeboden (1 in het nachtverblijf en 1 in het dagverblijf).		Controleer de aanwezigheid van de aankoopbonnen van strobalen in de administratie en resten van stroverstrekking in stal en uitloop. Noteer naam van de leverancier.	HI indien te weinig verstrekt. schorsing indien geen stro verstrekt.
V07 V08	Snavel en nagels schuren	Per legronde/ koppel wordt één gasbetonblok per 1000 kippen aangeboden (in het dag- en nachtverblijf), zodanig dat de kippen erop kunnen pikken en krabben.		Controleer de aanwezigheid van aankoopbonnen van gasbetonblokken in de administratie en de aanwezigheid van gebruik in de stal en uitloop. Noteer naam leverancier.	Schorsing indien geen gasbetonblok is verstrekt.
	Huisvesting				
H01	Huisvestingssysteem (Ingangscontrole)	Er zijn maximaal 3 leefniveaus (inclusief de stalvloer).	IKB, KAT		Schorsing
H03	(Ingangscontrole)	Bij volièresystemen zijn over de legnesten crossovers gemaakt van 2 m breed per 3000 leghennen, om de bereikbaarheid van de gehele stal en de overdekte uitloop te vergemakkelijken.			
H03b		De wand tussen dag- en nachtverblijf moet in zijn geheel open zijn gedurende de dag.		Noteer of de gehele wand open staat.	
H04	Bezetting	Opzet is maximaal 100%.		Vergelijk het CPE certificaat met de opzetgegevens. Noteer aantal toegestane hennen volgens CPE certificaat en aantal opgezette hennen.	Schorsing tot de volgende ronde wordt opgezet. Uitsluiting: bij 2e keer meer dan 100% van toegestane aantal hennen opgezet.

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
H05a	Bezetting	De bezetting in het dag- en nachtverblijf is op elk moment maximaal 6,7 hennen per m^2 bruikbaar oppervlakte. Het dagverblijf mag meegeteld worden bij het bruikbare oppervlak, mits overdag permanent toegankelijk. *De legnesten en vrije uitloop in de openlucht mogen niet meegeteld worden.*	LB, IKB, KAT	Controleer aan de hand van de gegevens van de ingangscontrole of niet meer dan 6 hennen per m^2 bruikbaar oppervlakte in de stal aanwezig zijn. Noteer het aantal toegestane hennen volgens ingangscontrole en aantal opgezette hennen.	Schorsing tot de volgende ronde wordt opgezet. Uitsluiting: bij 2e keer meer dan 100% van toegestane aantal hennen opgezet.
H06		De groepsgrootte is maximaal 6000 dieren.	IKB, KAT	Controleer of er per stalcompartiment niet meer de 6000 dieren werden gehouden.	HI indien aantal dieren per compartiment is >6000. Schorsing indien geen compartimenten zijn aangebracht.
H07 H08a	Strooisel	Leghennen hebben ieder ten minste de beschikking over een met strooisel bedekt oppervlakte van 250cm^2 per leghen. Het gehele vloeroppervlak van het nachtverblijf is ingestrooid.	LB, IKB, KAT	Meet het met strooisel bedekte oppervlak en bereken of dit voldoet aan 250cm^2/hen. Noteer berekening.	HI indien <75% deel van vloeroppervlak is ingestrooid. Schorsing <250cm^2/hen. Schorsing indien strooisel ontbreekt.
H09	(Ingangscontrole)	De scharrelruimte mag niet verhoogd worden aangebracht.	IKB, KAT		
H10a		De strooiselruimte binnen is bedekt met strooisel in een laag van minimaal 2 cm dikte.		Meet op een aantal plaatsen in de stal of de strooisellaag voldoende dik is. Noteer 3 strooiseldiktes en meetplaats.	HI indien niet overal 2 cm.
H11		Strooisel bestaat uit houtkrullen, stro, gehakseld stro, turf, zand of ander materiaal met een losse structuur dat legkippen in staat stelt aan hun	LB, IKB	Controleer op verschillende plaatsen in de stal of het strooisel een losse structuur heeft zodat het kan voorzien in	HI indien veel aangekoekte plekken in het strooisel zitten.

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
		ethologische behoeften te voldoen (stofbaden, scharrelen en bodempikken).		de behoeften van de kip. Noteer type strooisel.	Uitsluiting indien strooisel ontbreekt.
H12 H13	Zitstokken	De leghennen hebben de beschikking over 15 cm zitstok, waarvan tenminste 50% verhoogd. Geïntegreerde zitstokken (max. 5 cm per leghen) zijn 2 cm hoog.	IKB, KAT	Meet steekproefsgewijs een vijftal zitstokken, noteer hoogte, lengte zitstokken en noteer berekening cm zitstok per hen.	Schorsing bij 10% afwijking, uitsluiting >10% afwijking beschikbaarheid.
H14	Daglicht en licht	Er moet natuurlijk daglicht in de stal zijn. Totaal oppervlak van de lichtopeningen komt overeen met tenminste 50% van het grondoppervlak. De openingen zorgen voor een gelijkmatige verdeling van het licht in het activiteitengedeelte van de stal. Indien gebruik wordt gemaakt van zijvensters is de diepte van de ruimte maximaal 6 meter. Direct zonlicht in de stal wordt vermeden.	IKB, KAT	Noteer oppervlakte natuurlijke daglicht in de stal, uitgedrukt in % grondoppervlak en type lichtopening. Noteer tevens of de lichtopeningen volledig bedekt kunnen worden en op welke wijze.	Schorsing indien <50% grondoppervlak daglicht. Uitsluiting indien geen daglicht in de stal komt.
H15		De lichtsterkte is minimaal 20 Lux.	IKB, KAT	Meet de Luxsterkte op dierhoogte en noteer aantal Lux op 2 verschillende punten in de stal.	HI onaangekondigd. Schorsing indien <10 Lux.
H16		De lichtperiode bedraagt ten hoogste 16 uur per dag.	VB, IKB, KAT	Noteer lichtschema.	HI onaangekondigd. Schorsing indien >16 uur licht.
H17		Per 24 uur is er een donkerperiode van minimaal 8 uren, met vooraf en aan het einde een schemerperiode.	VB, LB, IKB, KAT	Noteer lichtschema.	Schorsing indien <8 uur donker.
	Klimaat	Het stalklimaat dient in orde te zijn; het mag niet stoffig zijn en er mag geen sterke ammoniakgeur aanwezig zijn.	KAT	Noteer of er sprake is van een afwijkend stalklimaat.	Waarschuwing.
	Dagverblijf				
O13a		In het dagverblijf is een extra strooiselvoorziening aangebracht van 20,9m^2 per leefgroep van 6000 dieren.		Controleer of de extra strooiselvoorziening aanwezig is en aan de voorwaarden	Uitsluiting indien voorziening ontbreekt.

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
O13b		De strooiselvoorziening is voorzien van turfmolm		voldoet. Noteer eventuele afwijkingen.	
	Vrije uitloop				
V01 V02 V03	Vrije uitloop	De stallen moeten voorzien zijn van openingen, om van het nachtverblijf naar het dagverblijf/overdekte uitloop te komen, die aangepast zijn aan de omvang van de dieren en die samen een totale lengte hebben van 7 meter per 100m^2 voor de dieren beschikbare ruimte in het nachtverblijf. Openingen naar het dagverblijf/ overdekte uitloop zijn evenredig verdeeld over de hele lengte van de stal en zijn tenminste 200 cm hoog en 2300 cm breed.	VB	Noteer de afmetingen en of de toegang naar de vrije uitloop voldoet aan de gestelde voorwaarden. Noteer de afwijkingen. *Neem een foto van de openingen.*	HI bij afwijkingen in doorgang <10%, Schorsing bij onevenredige verdeling openingen, opening <7m per 100 m^2 en >10% afwijking op openingen.
U01 U02		De hennen hebben vanaf 10.00 uur 's morgens minimaal 8 uur per dag, gedurende ten minste één derde van hun leven, de beschikking over een begroeide vrije uitloop in de open lucht. Dit wordt dagelijks bijgehouden/geregistreerd op een "uitloopkalender".	VB, IKB	Controleer of de hennen minimaal 8 uur per dag toegang hebben tot de vrije uitloop en of deze dagelijks gebruikt wordt aan de hand van de "uitloopkalander".	AH indien uitloopkalander niet dagelijks ingevuld is. Schorsing bij twijfel over gebruik. (HI onaangekondigd) Uitsluiting indien geen vrije uitloop aanwezig of duidelijk dat deze niet dagelijks gebruikt wordt.

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
U07 U08 U06		De uitloop in de open lucht moet beschutting bieden (bijv. in de vorm van boomstronken), grotendeels bedekt zijn met houtsnippers en/of grond en moet de dieren schuilmogelijkheden bieden. Daarnaast dienen zij de beschikking te hebben over 2 werkende drinktorens per 6000 dieren. De onoverdekte uitloop bedraagt 216m^2 per leefgroep van 6000 dieren.	VB	Contoleer of de vrije uitloop beschutting biedt tegen slecht weer en roofdieren. Noteer welke wijze van beschutting aanwezig is. *Neem een foto van de uitloop met daarop o.a. de (verschillende) beschuttingsmogelijkheden en voeder- en drinkgelegenheden.*	HI bij vrije uitloop zonder beschutting
V10	(Ingangscontrole)	De uitloop in de open lucht mag zich niet verder dan 50 m van de dichtstbijgelegen uitgang van de stal uitstrekken.	IKB	Meet de afstand op en noteer deze.	
	Gezondheid en ingrepen				
G01 G02		Zieke en gewonde dieren worden afgezonderd en behandeld of op een humane wijze gedood.	AW	Controleer of er een afgezonderde ziekenboeg is, of op welke wijze zieke dieren worden gedood.	HI
G03		Het behandelen en toucheren van de snavels is verboden	VB	Controleer of de snavels van de hennen onbehandeld zijn.	Uitsluiting
	Bedrijfsgezondheids- en welzijnsplan	Het koppel moet onder begeleiding staan van een GVP erkende pluimveedierenarts met wie de pluimveehouder een bedrijfsgezondheids- en welzijnsplan heeft opgesteld. Pluimveehouder, dierenarts en eventueel de bedrijfsadviseur kijken of op de thema's dierenwelzijn, diergeneesmiddelengebruik, klimaat, bedrijfshygiëne, strooisel, uitgangsmateriaal, voer, en technische resultaten maatregelen kunnen worden genomen die de diergezondheid	IKB	Controleer of er een door de GVP erkende pluimveedierenarts opgesteld bedrijfsbehandelplan op het bedrijf aanwezig is. Noteer naam van de dierenarts en plaats.	HI

Norm	Welzijnsaspect / voorziening	Normen kenmerk met 3 sterren	Opmerking	Interpretatie	Sanctie
		verbeteren. De maatregelen worden vastgelegd. Het volgende jaar wordt gekeken of de maatregelen tot verbeteringen hebben geleid.			
G04		De dieren worden gevaccineerd tegen Salmonella	IKB, KAT	Controleer vaccinatieschema en noteer vaccinatiedata laatste twee koppels	AH

Appendix 5: Details survey

Thailand

VIV SURVEY ABOUT SUSTAINABILITY IN POULTRY FARMING

Dear Ms. Dijkstra,

Sustainability is key nowadays. Therefore we are conducting a survey about the sustainability in poultry farming under our VIV Asia visitors.

We would highly value your input. Please enter the survey by clicking this link. It contains 8 questions, so it will only take 5 minutes of your time. For your convenience the survey is in Thai language.

We would like to thank you very much for your cooperation!

Kind regards,

Anke Dijkstra
VIV worldwide

VIV worldwide

VNU Exhibitions Europe, Postbus 8800, 3503 RV Utrecht.
VNU Exhibitions

Sustainability in poultry farming

Dear Sir / Madam,

Thank you for visiting our survey. By filling out this 5 minute survey, you will help us to obtain the very best results.

Kind regards,

Anke Dijkstra

VIV worldwide

ฟาร์มของคุณเลี้ยงไก่ไว้จำนวนกี่ตัว (จำนวน)/How many chickens live on your farm? (number)

Type number

20 characters remaining

ฟาร์มของคุณมีคนงานจำนวนกี่คน (จำนวน)/How many employees work on your farm? (number)

Type number

20 characters remaining

ฟาร์มของคุณเลี้ยงไก่ชนิดใด/What type of chickens live on your farm?

- ไก่เนื้อ/Broilers
- ไก่ไข่/Layers

คุณเป็นเกษตรกรผู้เพาะเลี้ยงสัตว์ปีกแบบใด/What type of poultry farmer are you?

- แบบดั้งเดิม (เลี้ยงในโรงเรือนปิด)/Conventional (closed battery housing)
- แบบเลี้ยงในกรงปิด (เลี้ยงในพื้นที่ปิดมิดชิด)/Enriched cage farming (closed)
- แบบอิสระ (เลี้ยงภายนอกบางส่วน)/Free range (partially outside)
- แบบอินทรีย์/Organic

คุณประเมินว่าฟาร์มของคุณนั้นมีความยั่งยืนเพียงใด (เรียงลำดับ 1-5)/How would you asses your farm in terms of sustainability? (ranking 1-5)

★ ★ ★ ★ ★

0/5

สิ่งใดคือสามสิ่งสำคัญที่สุดในการให้ได้มาซึ่งความยั่งยืนในการทำฟาร์มเพาะเลี้ยงสัตว์ปีก/What are the three most important things when obtaining sustainability at a poultry farm?

- การปล่อยก๊าซคาร์บอนไดออกไซด์/CO2 emission
- การใช้ที่ดิน/Land use
- การใช้น้ำ/Water use
- พลังงาน/Energy
- การสร้างรายได้/Revenue generated
- ความปลอดภัยด้านอาหาร/Food safety
- การใช้ยา/Medicine use
- การเป็นอยู่ของสัตว์/Animal welfare

คุณสามารถทำสิ่งใดดังต่อไปนี้เพื่อให้สามารถดำเนินงานได้อย่างยั่งยืนยิ่งขึ้น/On what could you improve in order to operate more sustainability?

- ลดการปล่อยก๊าซคาร์บอนไดออกไซด์/Reducing energy use by placing solar panels on the roof of a farm in order to reduce CO2 emission on the farm
- ปรับปรุงการใช้ที่ดินให้ได้ประโยชน์มากขึ้น/Reducing land use, by making more floors in the poultry houses.
- ลดปริมาณการใช้น้ำ/Keeping the water pressure as low as possible on the water drinking facilities of the chickens, so that the chickens have enough time to drink the water and there is no water spilled
- การสร้างรายได้/Produce more eggs, when it is needed expand farm, in order to generate more revenue.
- รักษาความปลอดภัยด้านอาหาร/Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety
- ลดปริมาณการใช้ยา/In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.
- เพิ่มคุณภาพชีวิตของสัตว์/Strive for the DLD certification
- ใช้พลังงานอย่างรู้คุณค่า/Use facemasks when working on the farm in order to prevent issues on the respiratory tract of farmers and employee.

โปรดอธิบายภายในหนึ่งประโยคว่าเกษตรกรผู้เพาะเลี้ยงสัตว์ปีกควรจะปฏิบัติอย่างไรเพื่อให้สามารถดำเนินงานได้อย่างยั่งยืนยิ่งขึ้น/Describe in one sentence what the poultry farmers should do in order to operate more sustainable?

Type a sentence

250 characters remaining

The Netherlands

Beste Ms. Dijkstra,

Duurzaamheid is een populair begrip en wordt steeds relevanter in onze sector. Daarom neem ik een korte enquête af met betrekking tot duurzaamheid in de pluimveehouderij in Nederland.

Ik verzoek u vriendelijk om via de volgende link 8 korte vragen in te vullen. Het zal maximaal 5 minuten van uw tijd nemen. De vragen zijn in het Nederlands en Engels beschikbaar.

Bij voorbaat dank ik u hartelijk voor uw tijd.

Vriendelijke groeten,

Anke Dijkstra
VIV worldwide

VIV worldwide

VNU Exhibitions Europe, Postbus 8800, 3503 RV Utrecht.
VNU Exhibitions

Duurzaamheid op de pluimveehouderij

Duurzaamheid is een populair begrip en wordt steeds relevanter in onze sector. Daarom neem ik een korte enquête af met betrekking tot duurzaamheid in de pluimveehouderij in Nederland.

Bij voorbaat dank ik u hartelijk voor uw tijd.

Vriendelijke groeten,

Anke Dijkstra

VIV worldwide

Hoeveel kippen leven er op uw pluimveehouderij? / How many chickens do live on your farm?

Hoeveel werknemers werken er op uw pluimveehouderij? / How many employees work on your farm?

Wat voor soort kippen houdt u op uw pluimveehouderij? / What type of chickens do live on your farm?

- Vleeskippen / Broilers
- Leghennen / Layers

Wat voor soort pluimveehouderij heeft u? / What type of poultry farmer are you?

- Conventioneel / Conventional
- Verrijkte kooi / Enriched cage farming
- Scharrel (gedeeltelijk buiten) / Free-range (partially outside)
- Biologisch / Organic

Wat zijn volgens u de drie meest belangrijke indicatoren met betrekking tot duurzaamheid op de pluimveehouderij? / What are the three most important things when obtaining sustainability at an egg producing farm?

- [ ] CO2 emissie / CO2 emission
- [ ] Landgebruik / Land use
- [ ] Waterverbruik / Water use
- [ ] Kosten / Costs
- [ ] Opbrengsten / Revenue
- [ ] Voedsel veiligheid / Food safety
- [ ] Antibiotica gebruik / Use of antibiotics
- [ ] Dierenwelzijn / Animal welfare
- [ ] Werknemer/boer welzijn / Employee/farmer health

Met de boven gemaakte keuze in gedachte, hoe zou u uw eigen pluimveehouderij (of legsector) beoordelen? / Taking in consideration the three options you chose above, how would you asses the layer sector in terms of sustainability? (ranking 1-5)

★ ★ ★ ★ ★

0/5

Wat zou u kunnen verbeteren om duurzamer te werk te gaan? / What could you do in order to operate more sustainable?

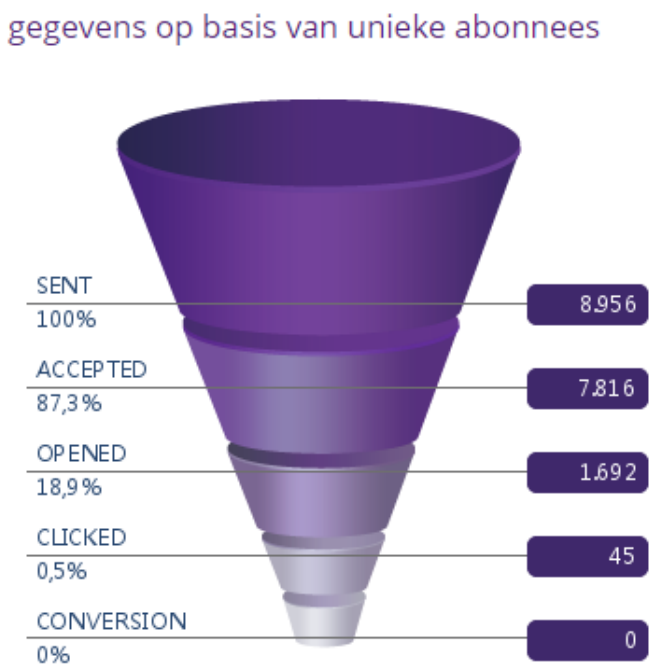
- [ ] Gebruik maken van mondkapjes door de werknemers, zodat de gezondheid minimaal wordt beïnvloed / Use face masks when working on the farm in order to prevent issues on the respiratory tract of farmers and employee.
- [ ] Een mest opvang systeem gebruiken om salmonella infecties te voorkomen / Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.
- [ ] Het plaatsen van zonnepanelen op het dak van de boerderij om het energie verbruik en ook CO2 emissie te verlagen / Reduce energy use by placing solar panels on the roof of a farm in order to reduce CO2 emission on the farm.
- [ ] De waterdruk laag houden zodat de kippen genoeg tijd hebben om het water op te nemen van de nippels / Keeping the water pressure as low as possible on the water drinking facilities of the chickens, so that the chickens have enough time to drink the water and there is no water spilled.
- [ ] Reduceren van land gebruik door meerdere etages in de stallen te maken / Reducing land use, by making more floors in the poultry houses
- [ ] Meer eieren produceren, zodat de opbrengsten stijgen / Produce more eggs, when it is needed expand farm, in order to generate more revenue.
- [ ] Voedselveiligheid (nog) beter waarborgen / Improving food safety
- [ ] Verlagen van kosten, door voer kosten te onderdrukken / Reducing costs, by reducing feed costs, since that is the biggest expense.
- [ ] Streven naar een (2 of) 3 sterren beoordeling van het 'Beter leven' keurmerk / Strive to a (two or) three stars ranking with regards to the 'Beter leven' hallmark
- [ ] Geen preventief gebruik maken van antibiotica / In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.

Omschrijf in een zin wat pluimveehouders kunnen verbeteren, naast boven genoemde punten, om duurzamer te opereren? / Describe in one sentence what other interventions, next to above mentioned, you could determine?

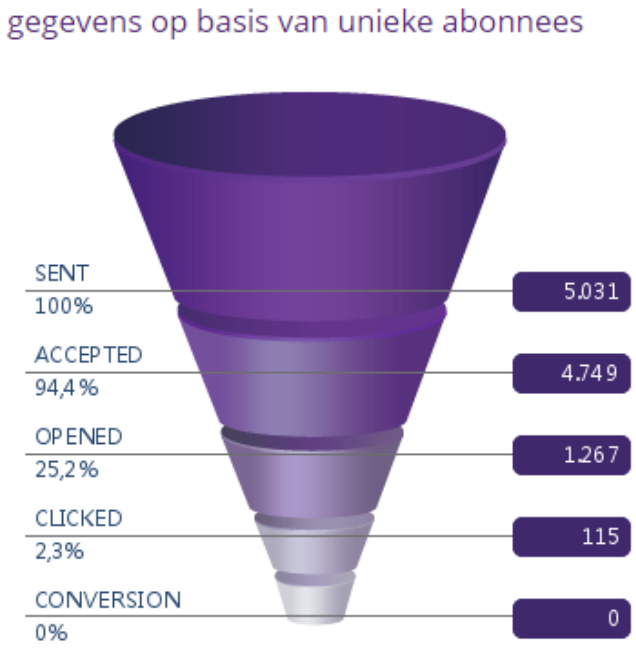
ENQUÊTE INDIENEN

Appendix 6: Mailings

Thailand



The Netherlands



Appendix 7: The survey results

The Netherlands

1. How many chickens do live on your farm? (number)

145000	90000	
3000	50000	
100000	10000	
160000	370000	138379,31
100000	180000	
100000	125000	
100000	125000	
100000	125000	
75000	75000	
75000	75000	
100000	75000	
100000	100000	
100000	650000	
450000	125000	
130000		

2. How many employees work on your farm? (number)

1	1	
1	1	
1	2	
1	2	
1	3	
1	40	2,4137931
1	1	
0	1	
0	1	
0	2	
2	1	
2	1	
3	0	
0	0	
0		

3. What type of chickens do live on your farm

9	32%	Broilers
20	68%	Layers

4. What type of poultry farmer are you?

13	43,8%	Conventional (closed battery housing)
4	12,5%	Enriched cage farming (closed)
7	25%	Free range (partially outside)
5	18,8%	Organic

5. What are the three most important things when obtaining sustainability at an egg producing farm?

Aantal	Ratio's	Indicator
13	44,8%	CO2 Emssion
10	34,5%	Land use
5	17,2%	Water use
10	34,5%	Employee's health
7	24,1%	Costs
6	20,7%	Revenue generated
11	37,9%	Food safety
10	34,5%	Antibiotic use
13	44,8%	Animal welfare

All	Layers	All	Layers	Indicator
13	9	44,8%	45,0%	CO2 Emssion
10	8	34,5%	40,0%	Antibiotic use
11	8	37,9%	40,0%	Food safety
13	10	44,8%	50,0%	Animal welfare

6. Taking in consideration the three options you chose above, how would you asses your farm in terms of sustainability? (ranking 1-5)

1	4	
1	4	
2	4	
3	4	
3	4	
3	4	3,6
3	4	
3	4	
3	5	
3	5	
4	5	
4	5	
4	5	
3	3	
4	4	

Layers only

4	4	
3	4	
5	3	
4	4	
3	4	3,571429
4	1	
4	4	
3	5	
4	5	
4	1	
2		

7. What could you do in order to operate more sustainable?

Aantal	Ratio's	Interventie
4	13,7%	Use facemasks when working on the farm in order to prevent issues on the respiratory tract of farmers and employee.
9	31,0%	Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.
23	79,3%	Reduce energy use by placing solar panels on the roof of a farm in order to reduce CO2 emission on the farm.
3	10,3%	Keeping the water pressure as low as possible on the water drinking facilities of the chickens, so that the chickens have enough time to drink the water and there is no water spilled.
7	24,1%	Reducing land use, by making more floors in the poultry houses.
6	20,7%	Produce more eggs, when it is needed expand farm, in order to generate more revenue.
7	24,1%	Reducing costs, by reducing feed costs, since that is the biggest expense.
13	44,8%	Since, the farms where the chickens have the best life are ranked with three stars with regards to the 'Beter leven' hall mark, so strive to a (two or) three stars ranking.
10	34,5%	In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.

All	Layers	All	Layers	
9	7	31,0%	35,0%	Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.
23	14	79,3%	70,0%	Reduce energy use by placing solar panels on the roof of a farm in order to reduce CO2 emission on the farm.
10	8	34,5%	40,0%	In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.

8. Describe in one sentence what other interventions, next to above mentioned, you could determine?

Dutch	English
Mijns inziens is voerconversie het belangrijkste als je het hebt over duurzaamheid.	In my opinion is the feed conversion most important when talking about sustainability
Alleen voor een betere opbrengst is verduurzaming mogelijk	**Only for the higher revenue sustainability is possible**
-	-
open naar consument	**Openness towards consumer**
boerenverstand gebruiken en nadenken waar we mee bezig zijn. Groter is niet per definitie beter.	**Back to basic and rethink what we are doing at the moment. Bigger is not always better**
Communiceren, het feit dat per eenheid voedingswaarde (energie en eiwit) dierlijke producten, waaronder ei en pluimveevlees, een van de meest duurzame producten zijn.	**Communicate the fact that per nutrition unit (energy and protein) animal products, especially eggs and poultry meat, are one of the most sustainable products.**
Door zo laag mogelijke kosten wat betreft voer en water, een zo duurzaam mogelijk eitje produceren.	**To reduce costs for feed and water, produce a sustainable egg**

-	**Diminish emission of fine dust particles and effect of too much manure on same piece of land.**
Pluimveehouders moeten energie besparen en emissie van alle soort van uitstoot reduceren en diervriendelijk produceren	**Poultry farmers should save energy, reduce emissions in all kind of sources and produce animal friendly.**
Kleinere aantallen dieren houden waardoor de dieren meer aandacht krijgen	Smaller amounts of animals at farms, so that they can receive more attention
betere opbrengstprijs creëren	**Create a better selling price**
De meest belangrijke stap is het erkennen van het belang van duurzaamheid nadat helder is geformuleerd wat duurzaamheid is om er daarna naar handelen..	The most important step is to recognise the need of sustainability, afterwards define it clearly and act according it.
Data verzamelen en goed analyseren	**Collect data and analyse it**
Betere preventieve acties ondernemen om eventuele problemen voor te zijn. Dus geen gebruik van antibiotica, dit tackelen met pro en of prebiotica.	Improve preventive interventions in order to prevent problems. For example, do not use antibiotics, but pro and or prebiotics.
Produceren wat onze afnemers vragen.	Produce what the buyers demand
Fijnstof vraagt om een aanpak	**Fine dust needs to be tackled**
-	Food by products use for animal
geen anoniem product, maar leveren met naam van producent	**No anonymous, but supply with name of producer**
productie eenheden niet te groot laten worden. Meer regionale samenwerkingen zoeken, lokaal werken, transport van product verminderen. Dit geldt voor alles, grondstoffen, voer, eindproducten, mest etc.	**Do not let increase production quantity. More regional based cooperation, local work, reducing transport of the eggs. This counts for everything, such as raw materials, feed, end products, manure etc.**
Alles is genoemd	**Everything is named above**
Zuid-amerikaanse soja vervangen door andere eiwit bronnen (insecten?)	**Replace the soya from South America to another source of protein, such as insects.**
Op de ingeslagen weg voortgaan en innovatieve ontwikkelingen goed volgen en waarderen op gebruik op eigen bedrijf, samen of als sector	Go further with the way we are going now. Implement innovative developments and value use on own company, together or as sector.
Efficiency vergroten, door schaalvergroting: meerdere bedrijven samenvoegen tot één. Hierdoor stijgt de omzet, dalen de kosten en kunnen ze betere prijzen bedingen bij hun klanten. Dit vervolgens investeren in verbetering van duurzaamheid	**Increase efficiency through scaling: add companies together to one big company. Hereby will increase the income, decrease the costs and better prices will be arranged for the customers. Eventually invest in improving sustainability.**
-	-
-	-
-	-
-	-
-	-
-	-

Answers in **bold** are answered by the layer farmers.

Thailand

1. How many chickens do live on your farm? (number)

500000	100000	
7300	300000	
200000	300000	Average
200000	300000	312482,7273
200000	300000	
120	360000	
200	10000	
2500000	3000	
1100000	190000	
100000	4000	
100000	100000	

2. How many employees work on your farm? (number)

38	20	
37	20	Average
15	20	37,18181818
15	18	
70	40	
65	120	
30	2	
1	10	
100	50	
42	25	
20	60	

3. What type of chickens do live on your farm

10	45%	Broilers
12	55%	Layers

4. What type of poultry farmer are you?

8	36,4%	Conventional (closed battery housing)
11	50,0%	Enriched cage farming (closed)
1	4,5%	Free range (partially outside)
2	9,1%	Organic

5. What are the three most important things when obtaining sustainability at an egg producing farm?

Aantal	Ratio's	Indicator
10	45,5%	CO2 Emssion
3	13,6%	Land use
8	36,4%	Water use
0	0,0%	Employee's health
11	50,0%	Revenue generated
16	72,3%	Food safety
7	31,8%	Antibiotic use
13	59,1%	Animal welfare

All	Layer	All	Layer	Indicator
11	7	50,0%	58,3%	Revenue generated
16	10	72,3%	83,3%	Food safety
13	8	59,1%	66,7%	Animal welfare

6. Taking in consideration the three options you chose above, how would you asses your farm in terms of sustainability? (ranking 1-5)

2	4	
2	4	
2	4	
3	5	
3	5	
3	5	3,954545455
4	5	
4	5	
4	5	
4	5	
4	5	

Layers only:

4	
2	
5	
3	
5	
4	3,916667
4	
2	
5	
5	
4	
4	

7. What could you do in order to operate more sustainable?

Aantal	Ratio's	Interventie
7	31,8%	Use facemasks when working on the farm in order to prevent issues on the respiratory tract of farmers and employee.
14	63,6%	Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.
11	50,0%	Reduce energy use by placing solar panels on the roof of a farm in order to reduce CO2 emission on the farm.
6	27,3%	Keeping the water pressure as low as possible on the water drinking facilities of the chickens, so that the chickens have enough time to drink the water and there is no water spilled.
6	27,3%	Reducing land use, by making more floors in the poultry houses.
9	40,9%	Produce more eggs, when it is needed expand farm, in order to generate more revenue.
3	13,6%	Reducing costs, by reducing feed costs, since that is the biggest expense.
12	54,5%	Since, the farms where the chickens have the best life are ranked with three stars with regards to the 'Beter leven' hall mark, so strive to a (two or) three stars ranking.
14	63,6%	In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.

All	Layer	All	Layer	
14	9	63,6%	75,0%	Use a manure collecting system in order to reduce the chance of salmonella infection to secure food safety.
14	7	63,6%	58,3%	In order to prevent antibiotic resistance, the best solution is to do not preventively make use of antibiotics.
12	7	54,5%	58,3%	Strive for a DLD certification

8. Describe in one sentence what other interventions, next to above mentioned, you could determine?

Thai	English
	No comment
	No comment
เพิ่มประสิทธิภาพการเลี้ยง	Optimized feed
ดูแลเรื่องการสุขาภิบาล	**Supervision of sanitary**
สมดุลทั้งด้านรายได้ ควบคู่การดูแลสิ่งแวดล้อมและชุมชน	Balancing both the revenue side Alongside environmental stewardship and community
สมดุลทั้งด้านรายได้ ควบคู่การดูแลสิ่งแวดล้อมและชุมชน	**Balancing both the revenue side Alongside environmental stewardship and community**
ควรเป็นโรงเรือนแบบปิดเพื่อป้องกันการติดต่อของโรคสัตว์ปีก	**Sheds should be closed to prevent transmission of the disease, poultry.**
	take for your life
มีการจ้างงานคนในพื้นที่แล้วมันจะทำให้คนในพื้นที่มีรายได้และอยู่ร่วมกันได้อย่างยั่งยืน	Hiring local people, it will make people in low income areas and coexist sustainably.
ใช้ทรัพยากรอย่างรู้คุณค่ามากที่สุด	**Knowing most valuable resource.**
ควบคุมการผลิตทุกขั้นตอนให้มีคุณภาพ	Production control process quality.
เกษตรต้องมองการณไกล รู้จักใช้วัสดุ สิ่งแวดล้อมให้เหมาะสมกับเศรษฐกิจ	**Agriculture must look at the way Known materials The economic environment**
ดูแล รักษา อย่างเป็นระบบ	**Care system**
นำของเสียมาใช้ประโยชน์	**Waste utilization**
ควรดูแลสัตว์ปีกให้แข็งแรงเพื่อให้มีผลผลิตที่ดี โดยให้อาหารที่ดี มีการจัดการสุขาภิบาลที่ดีจะลดการใช้ยาปฏิชีวนะน้อยลงเพื่อประชาชนจะมีอาหารปลอดภัยในการบริโภค และปัจจุบันนี้การใช้มูลสัตว์มาทำBio Gasเพื่อรักษาสิ่งแวดล้อมก็เป็นสิ่งควรลงทุนแล้ว	Poultry should be healthy to have a good yield. The good food Good sanitation managed to reduce the use of antibiotics so that fewer people have safe food to consumers. Currently, the use of manure to make Bio. Gas Respondents environment, it is advised to invest Moi.
มีกำไรอย่างยั่งยืน	**Profitable and sustainable**
ทำให้เกิดสมดุลของระบบนิเวศในฟาร์ม	Cause ecological balance on the farm.
ลดผลกระทบที่ส่งผลกับสิ่งแวดล้อม Food safety และantibiotic unless	**Reducing the environmental impact that results Food safety and antibiotic unless.**
รักษาต้นทุนการผลิตให้ต่ำสุดและรักษาสุขภาพไก่ให้ดีเพื่อผลผลิตที่ดีต่อเนื่องด้วย	Keeping production costs low and maintaining healthy chickens to produce good continuity.
	Sharing your profit for interested customer and improve environment.
	No comment
	Working Professional

Answers in **bold** are answered by the layer farmers.

Appendix 8: The interviews

Interview with organic poultry farmer Chris Borren in Voorthuizen on 31st of May 2016.

Q; What do you think sustainability includes in poultry farming?
A; I think it is the same as in every sector. I would think of land use, efficiency and emission of trucks or any other equipment. I would say a perfect balance between people, planet and profit is the basis of sustainability.

Q; Do you think animal welfare is important in relation to egg production?

A; For me it is a must, of course, that the animals can go outside since I am an organic farmer. In the past I had a traditional farm and since 1990's I am an organic farmer. I do not see any differences in egg production, organic chickens are not producing less eggs than chickens on a traditional farm.

Q; What do you think about stress on your farm (animal welfare)?

A; In order to reduce the stress off the layers, I have some cocks walking around to manage the order between the hens, so there are less fights between the hens. The only big stress factor are the raptors etc.

Q; What medicines are you allowed to use and how often do you use it?

A; Organic farmers are allowed to use a medicine based on garlic. Nevertheless, I do not hardly use anything on my farm. My animals are resistant to a lot of diseases and I try to prevent them with feeding. In my opinion, chickens can heal themselves when they are affected with avian influenza for example, chickens can handle a lot when they are not treated with medicines.

Q; How far is the organic part going in the chain?

A; The chickens eat organic feed, so the grain and other ingredients are not sprayed with pesticides etc. Besides, the use of land is also taken into consideration, I am convinced, that the land can be used longer and have greater productivity when produced organically. The land is not allowed to be treated with fertilizer. Also after lifetime of the animals, they are slaughtered differently than traditional chickens. Nevertheless, our eggs and meat is just going with the 'normal' eggs and meat in the truck, so transport stays the same.

Q; What is the revenue generated yearly?

A; 12,000x310=3,720,000x€0.15=€558,0000 (approx.)

Interview with poultry farmer Jan Noorlander in Barneveld on 31st of May 2016.

Q; What do you think sustainability includes in poultry farming? How could you make your farm more sustainable?

A; This is hard question to me, it is very broad. Generally it comes all to the same people, planet profit. I would change people into chickens instead though. One of the things I still could do is placing solar panels in order to collect my own energy, that is the interventions which would work on my farm. Besides, poultry manure is going to BMC Moerdijk, where they make energy and obtain minerals from it. Next to that, I am very innovative, when there are new technologies, I am one of the first persons who want to try. I have also a contract with one of the farm equipment producers, they are testing their new technologies at my farm.

Q; Do you think animal welfare is important in relation to egg production?

A; Of course it is. Therefore I take care of the right temperature, light and feed of course. Every three weeks, we do random checks of the layers. We look into their bodies and check several things. Together with a veterinarian and promoter of feed, we are changing the feed according the check results, so I am very busy with the animal welfare in that part.

Q; Which medicines are allowed to use and how often do you use it?

A; I am allowed to make use almost every medicine since I am a free range farmer and there are no strict rules for that. However, I try to prevent diseases and weakness under my chickens with my feed as told earlier. Additionally, I am not using antibiotics to prevent, only when it is the last solution at that moment. So, I do not use a lot of medicines.

Q; What is the revenue generated yearly?

A; 100,000x320=32,000,000x€0,07= €2,240,000

65% of my revenue is spend on feed, rest is spend on other operational costs and my salary.

Interview with Dr.ir. Piet Simons in Barneveld on 31st of May 2016.

Q; How would you describe the poultry industry in terms of growth, consumption and importance compared to other protein production sectors?

A; The poultry industry is still growing and is on the third place after swine and cows. However, the poultry industry is almost bigger than swine. Worldwide people eat 60 million ton eggs a year and we have around 15 billion chickens, which exclude chickens which are held for hobby. In the Netherlands we have around 30 million layers and 1000 farms. 20% is free range or organic. The Dutch poultry sector in egg grading has a leading world market position, 80%. Also the laying hen breeding has 40%. In the Netherlands, the most innovative companies are located.

Q; Are poultry farmers using medicines? If yes, how much per chicken and what sort of medicines?

A; Yes, they are, however, it is depending on the type of farm. An organic farmer is using natural medicines whereby it is a must that it contains garlic substances and traditional farmers are using a bigger range of medicines, whereby they are allowed to use antibiotics.

Q; How to assess animal welfare? How important is this for the farmers?

A; Chickens are 'happier' when they can do whatever they want and do the things they do naturally, so animal welfare is better at an organic farm. However, on an organic farm the chickens have more stress due to predators, but they have less stress with regards to fighting other hens, since there are cocks walking around. In a traditional farm, the chickens have less space, have fights and do not see sunlight. I think the stress-factor is very important in assessing animal welfare.

Q; What is the difference in food safety comparing organic and traditional eggs?

A; This is one of the most important things, since when the egg is not safe it will not allowed to be sold. Since the feed of the chickens is key in egg production, the 'traditional' chickens produce better eggs, as the ingredients of the feed are precisely secured and pesticides are used to prevent diseases in the crops. Next to that, the chickens are healthier, due to the fact that they are treated with medicines. The organic chickens need to cover up them self without hardly any medicines. Same counts for the feed, the crops can be influenced by mould or insects and for that reason the quality is less.

On top of that, the cages of traditional chickens are clean and taken care of very well. Hygiene is very important in relation to food safety. However, at an organic farm, the chickens are walking around in their own manure, this is also not advisable for the food safety.

Q; How do you think that sustainability is defined in poultry farming? And what do you prospect for the future?

A; I am not a big fan of the term sustainability. Nevertheless, I think it is about chickens, planet, people and profit, whereby you should especially look at the environment, welfare, diseases, profit, food safety.

Q; Could you also tell something about the Thais market?

A; In Thailand, the farmers and consumers prioritise food safety, environment and hygiene. Compared to the Netherlands, they have to take a lot more care about diseases since the climate is totally different. In Thailand, it is still allowed to put the chickens in the battery cage. In Thailand they look very rational to sustainability.

Appendix 9: Layers compared to whole research

Since the first four questions (1-4) are questioning general information about the farmers, whereby reviewing the type of farmers who have answered this question is of importance. For this part of reviewing the results are only seen to the last four questions (5-8), since those questions will especially help to give answer to the research questions. The details can be found in appendix 7.

The Netherlands

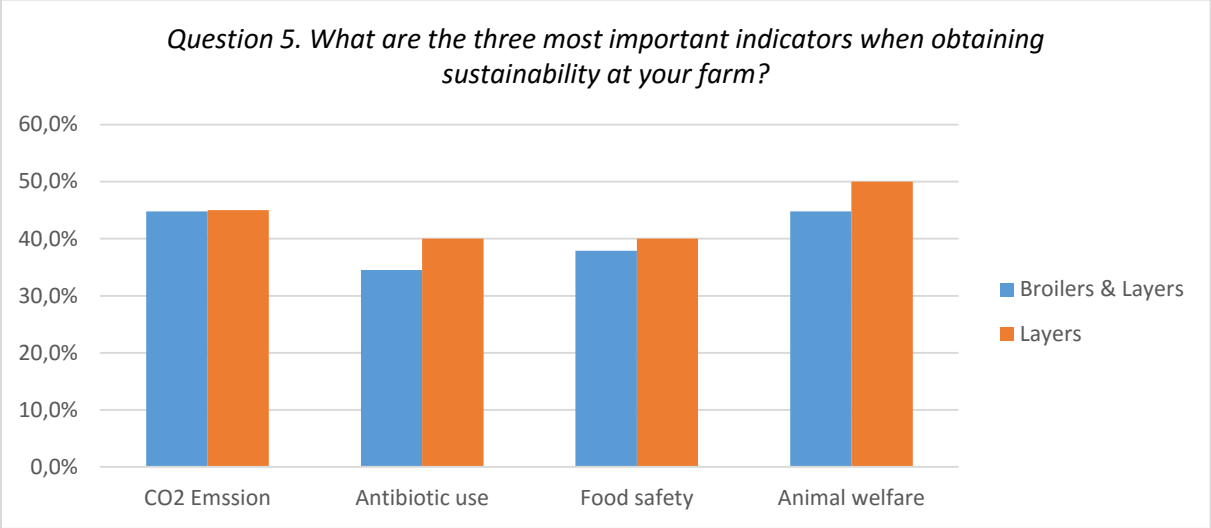


FIGURE 9 QUESTION 5 OUTCOMES LAYERS – THE NETHERLANDS

The question asks for the three most important indicators, however, antibiotic use and food safety are scoring equally, for that reason both are included in figure 9. Due to the fact that this question is asking for the top three most important indicators when obtaining sustainability at a poultry farm, the decision is made to compare only the highest scoring indicators. When looking to the ratios of the whole research, reviewed in blue, and the layers, reviewed in red, there is a slight difference in outcomes. Especially by the indicators antibiotic use and animal welfare. Besides, CO_2 emission, antibiotics use, food safety and animal welfare have the highest ratios for the egg producing farms. However, when taking both type of farmers in consideration, is food safety scoring higher than antibiotic use.

Question 6. Taking in consideration the three options you chose above, how would you asses your farm in terms of sustainability? (ranking 1-5)

	Broilers & Layers	Layers
Ranking	3,6	3,6

TABLE 13 QUESTION 6 OUTCOMES LAYERS - THE NETHERLANDS

In general poultry farmers scoring themselves on CO_2 emission, antibiotics use and animal welfare with a 3,6. Also only the layers score themselves with a 3,6 when looking at those three indicators.

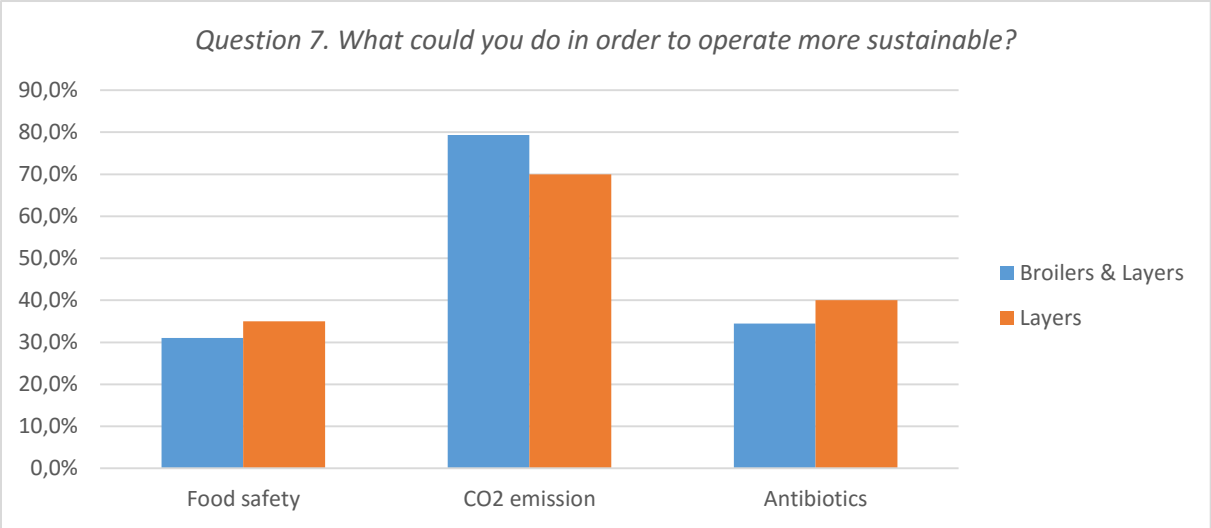


FIGURE 10 QUESTION 7 OUTCOMES LAYERS - THE NETHERLANDS

Comparing the results of the whole research and the layers only, there are differences in ratios. Nevertheless, in both cases the management interventions linked to food safety, CO_2 emissions and antibiotics are scoring the highest (management interventions reviewed in table 6). Besides, placing solar panels on the roof of the farms is scoring the highest by far. It might be that this is chosen so often, because it is an upcoming trend in the Netherlands and farmers in intensive livestock are already implementing this management intervention on their farms (Horst, 2013).

Question 8. Describe in one sentence what other interventions, next to above mentioned, you could determine?

The answers given by the Dutch egg producers are varying a lot from each other. Most given answers are related to profit, reducing costs for feed and increasing revenue. Besides, second most given answers are related to regional cooperation between farmers, whereby bigger is not considered as better in some cases. Transparency towards customers is also a point where the gain could be according the farmers. Also Jan Noorlander (appendix 8) agrees with this point.

Thailand

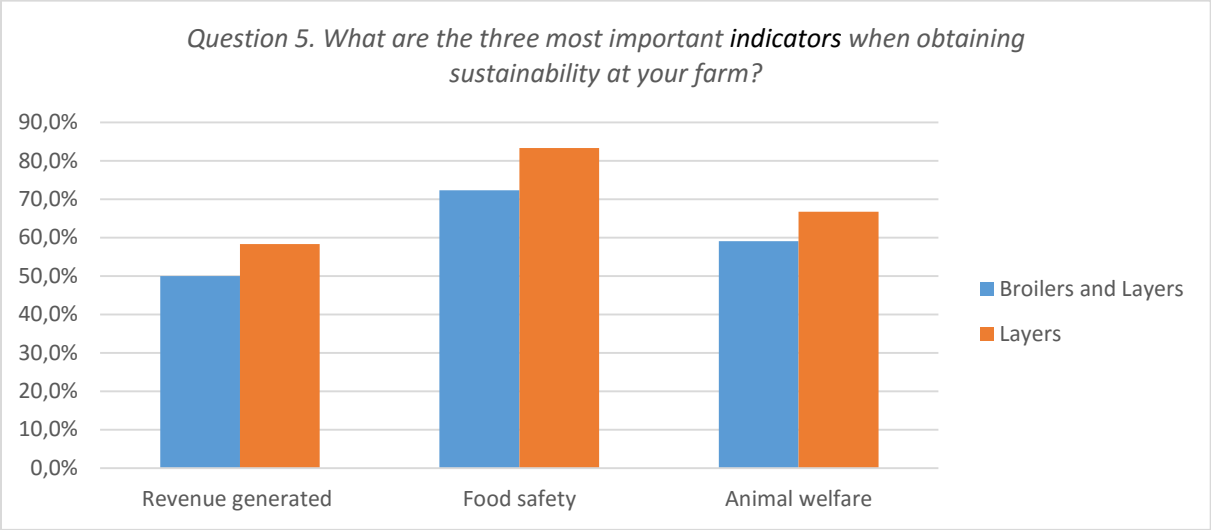


FIGURE 11 QUESTION 5 OUTCOMES LAYERS – THAILAND

Due to the fact that this question is asking for the top three most important indicators when obtaining sustainability at a poultry farm, the decision is made to compare only the highest scoring indicators. The three most important indicators when obtaining sustainability at the poultry farms in Thailand are revenue generated, food safety and animal welfare. When looking at broilers and layers the outcomes are those three indicators and also when looking only at layers. However, in ratios is a slight difference. When looking at layers farms only, the ratios are higher than when looking at both farm types.

	Broilers & Layers	Layers
Ranking	4	3,9

TABLE 14 QUESTION 6 OUTCOMES LAYERS – THAILAND

When comparing the rankings reviewed in table 13, it can be concluded that the layers are scoring themselves a bit lower than broilers farmers on revenue generated, food safety and animal welfare. However this difference is only 0,1.

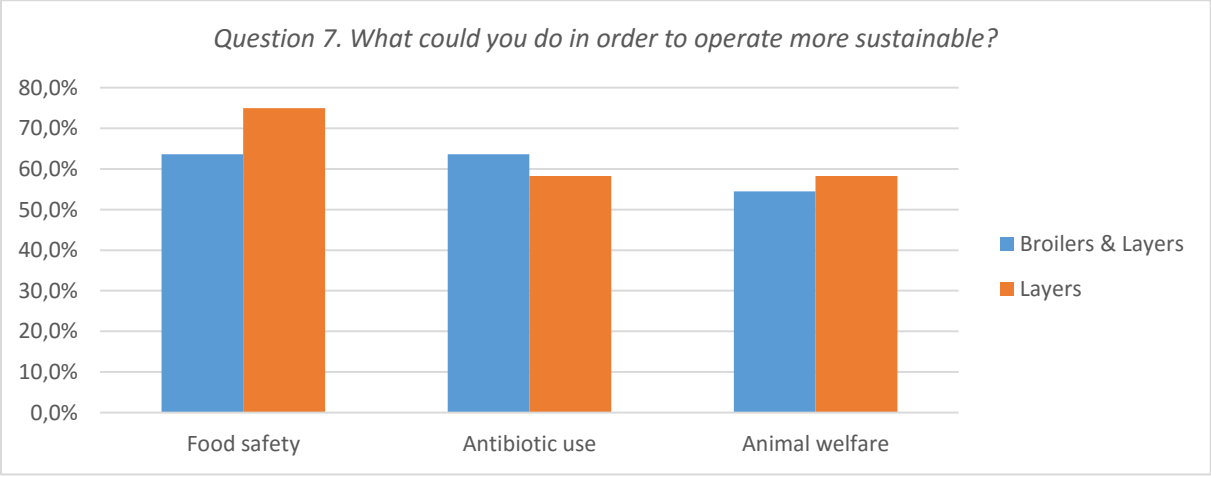


FIGURE 12 QUESTION 7 OUTCOMES LAYERS - THAILAND

A manure collecting system, stop preventive use of antibiotics and striving for a DLD certificate are the three highest scoring management interventions for the Thai poultry farmers. There are differences in ratios, especially at food safety (10% difference) comparing the whole sector and layers.

Question 8. Describe in one sentence what other interventions, next to above mentioned, you could determine?

The Thai egg producing farmers are giving answers with regards to finding the right balance between People, Planet and Profit. Besides, egg producers answered that gains could be reached by improving hygiene and cleaning, disease prevention and knowing the resources and preventing the depletion of the resources.

Appendix 10: Methodology – the proposal

In this chapter the research design, data collection and data analyses are discussed. This part of the w is key when drawing up conclusions and answering the main research question.

Research design

The research is on a qualitative bases, whereby the study design oral history will be used. This is an approach to study perceptions, experiences and accounts of an event or gathering historical knowledge as viewed by individuals (Kumar, 2011).

This research is combined with an internship at VIV and will last 21 weeks and will consist of field and desk research. The field research consists of interviews with Dutch experts and a visit to the Pluimvee museum in order to gain general information and knowledge. In order to give answers to the main research question and sub-questions a survey will be send out to the poultry farmers in the Netherlands and in Thailand. In order to reach the Dutch poultry farmers, the database of the visitors of VIV Europe 2014 will be contacted. In order to reach the Thai poultry farmers, the database of the visitors of VIV Asia 2015 will be consulted. This will help with making three to five action points where VIV is aiming for.

The desk research will be mainly be research in literature, such as books, researches from other parties, articles found on internet and webpages.

The 'Beter Leven' hallmark is chosen due to their wide range of providers of the hallmark products and with the number of providers is the biggest party (Dierenbescherming, 2015). Taking into account the things considered by the 'Beter Leven' hallmark a conclusion will be drawn about the farmers care for animal welfare.

Data collection

The survey is translated into Thai, this will secure the understanding with the interviewed party.

In order to gain the view of the poultry farmers in the Netherlands, the survey was also be sent out to Dutch poultry farmers.

A survey is a written list of questions, the answers to which are recorded by respondents. In a questionnaire respondents read the questions, interpret what is expected and then write down the answers. The only difference between an interview schedule and a questionnaire is that in the former it is the interviewer who asks the questions (and if necessary, explains them) and records the respondents replies on an interview schedule, and in the latter replies are recorded by the respondents themselves (Kumar, 2011). So the response will be more shallow and general. Therefore very concrete

questions were asked in the survey and the intentions of VIV or the sector are reviewed in the questions.

Data analyses

After collecting all the data, it is time to analyse the data in order to draw conclusions. Kumar described 4 steps in 'Research methodology: A step by step guide' in order to analyse data in a qualitative research. The first step is identify the main themes, step two is assign codes to the main themes, step three is classify responses under the main themes and the last and fourth step is integrate themes and responses in to the text of the report (Kumar, 2011).

In order to assess the validity of the results, the active participation rate is calculated. According to Saunders there are two types of response rates: total and active response rate. The following calculation uses active response rate, which also includes the illegible respondents, who despite of several attempts did not respond.

The calculation looks as follows:
Active response rate = total number of responses / [total number in sample – (ineligible + unreachable)] x 100% (Saunders, 2009).