University of Veterinary Medicine Budapest

Center for Animal Welfare

Comparison of different pig husbandry systems in terms of animal welfare

Különböző sertéstartási rendszerek állatjólléti szempontú összehasonlítása

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Abstract

The goal of the Thesis was a comparison of pig husbandry systems used in Norway and the EU, with focus on the differences between indoor and outdoor keeping. Research concerning the different systems in use, is based on answers from a questionnaire sent out to both large- and small-scale pig farmers.

The farmers all would agree that the welfare of the pigs where of the greatest importance. How to maintain this goal was not as simple to answer. The general opinion on the use of environmental enrichments where positive, with almost all the farmers answering that they to some extent tried to use this at their own farms. The housing types however differed greatly, with some farmers saying that only outdoor keeping could provide a good enough environment for the pigs. While others preferred indoor keeping and where worried about the potential risk of diseases spreading into the herds if the animals were kept outside.

Differences and similarities in legislations between EU and Norway are also included. There are lots of similarities between the countries, but especially with regards to medical interventions some major differences can be seen. Among others, teeth clipping and tail docking is not allowed in Norway as compared to the EU. The use of both local anesthesia and pain management is obligatory when castrating pigs in Norway, while in the EU, this is not needed if the intervention is performed before the age of 7 days.

Absztrakt

A szakdolgozat célja a Norvégiában és az EU-ban használt sertéstartási rendszerek összehasonlítása, különös tekintettel a beltéri és kültéri tartás közötti különbségekre. A kérdőíves kutatásban különböző rendszereket alkalmazó kis- és nagylétszámú sertéstelepek képviselői vettek részt.

A gazdák egyetértenek abban, hogy a sertések jólléte a legfontosabb,de n. Em volt olyan egyszerű megválaszolniuk, hogyan lehet megvalósítani ezt a célt. A környezetgazdagítások alkalmazásáról kialakult általános vélemény pozitív volt, szinte minden gazdálkodó azt válaszolta, hogy bizonyos mértékig alkalmazza ezt saját gazdaságában. A tartási módok azonban nagymértékben eltértek egymástól, egyes gazdák szerint csak a szabadban történő tartás biztosíthat megfelelő környezetet a

sertések számára. Más gazdálkodók a beltéri tartást részesítették előnyben, és aggodalmukat fejezték ki azzal kapcsolatban, hogy az állatok kültéri tartása esetén a betegségek továbbterjedhetnek az egész állományban.

Az EU és Norvégia jogszabályai közötti különbségek és hasonlóságok feltárása is célja a kutatásnak, k. Ülönösen az orvosi beavatkozások terén tapasztalható néhány jelentős eltérés. Többek között a fogak lecsípése és a farok vágása sem engedélyezett Norvégiában-, ellentétben az EU-val. Sertés kasztrálásakor mind a helyi érzéstelenítés, mind a fájdalomcsillapítás kötelező Norvégiában, míg az EU-ban nem szükséges, ha a beavatkozást 7 napos kor előtt végzik el.

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1. Introduction:

The European domestic pigs as we know them today, is said to derive from multiple local populations of wild boars around 9000 years ago (Giuffra, 2000). From that time, it has evolved into becoming a large part of the modern-day food industry. There are several different pig keeping systems in use today. These differ greatly from each other in terms of their production scale, with some farms only producing a few animals for their own consumption, while others produce thousands of swine yearly for meat consumers around the world. When it comes to the accommodations on the farm, large differences can be observed here too. Some pigs are kept indoors for the entire duration of their life, from birth until they reach slaughter weight at an age of approximately 18 to 26 weeks depending on the country and the product requirements (Marchant-Forde, 2009). Other more traditional housing systems keep the pigs outside for majority of the year or the entire year around.

With such diversity, depending on the system used on the farm, a variation in behavioural patterns can be observed from the pigs. The aim of this thesis is to look at the different pig husbandry systems in use today, and to compare them to each other with regards to the welfare of the animals in their care. After inquiring with a total of almost 100 pig farmers from different backgrounds, the main focus of this thesis will be: What are the major advantages or disadvantages with pigs kept indoors, outdoors or combination keeping? And what can be done to improve the welfare of pig keeping in the future?

Due to a growing pressure from the consumers and the state as well, stricter rules with regards to pig keeping is now enforced upon the farmers. I will therefore also be doing a comparison of the national legislations in my home country Norway, in contrast to the EU legislations and look at differences and similarities between them.

2. Literature review:

2.1 Keeping systems

The keeping systems of pigs varies from farm to farm and from country to country. In large scale pig farms, the operational setup is often divided into three main parts (Bruce Hoar, et al., 2014)

1. Breeding pig farms: where boars and sows used for breeding is produced for further sale to the commercial farms.
2. Fattening units: Has no breeding and therefore buys piglets after farrowing, keeping them until they reach slaughter weight.
3. Commercial farms (farrowing to finisher): Produces their own slaughter pigs from their breeding herds. These farms either produces their own breeding gilts or buys replacement gilts from the breeding pig farms.

2.2 Forms of farrowing systems

Individual farrowing systems: Is when the sow and piglets is separated from the other pigs for the duration of time between farrowing and weaning. The classical form is the so-called loose housing, using free farrowing pens. Consisting of a resting and a feeding area for the sow, and with a local heater in one of the corners of the pen for the piglets to keep warm in. The space should be large enough for the sow to lie down, turn around and provide the possibility for the sow to build a nest. Measures must be taken to avoid overlaying, like the use of farrowing rails on the sides of the pen etc. (Department for Environment, food, and rural affairs, 2020) Nowadays, it is very common for the heating lamps to be placed in a separate creep area, where the mother does not have access.

Farrowing crates is another form of individual farrowing system. In a farrowing crate, the sow is confined to a smaller metal crate inside of the pen, which allows her to move only backwards and forwards to a limited degree, but not turning around. The piglets however are free to move around as they wish in the pen around the sow (Pedersen, 2018). Like in the free farrowing pens, heating lamps or mats are used to make a resting area for the piglets, to prevent them from seeking the warmth of their mother and increasing the risk of them being crushed *(see figure 1).* This area shall provide a comfortable resting space, with enough room for all the piglets to rest simultaneously. The goal for the future is to

develop new and better systems, where the confinement of sows in such crates are no longer necessary (Department for Environment, food, and rural affairs, 2020).

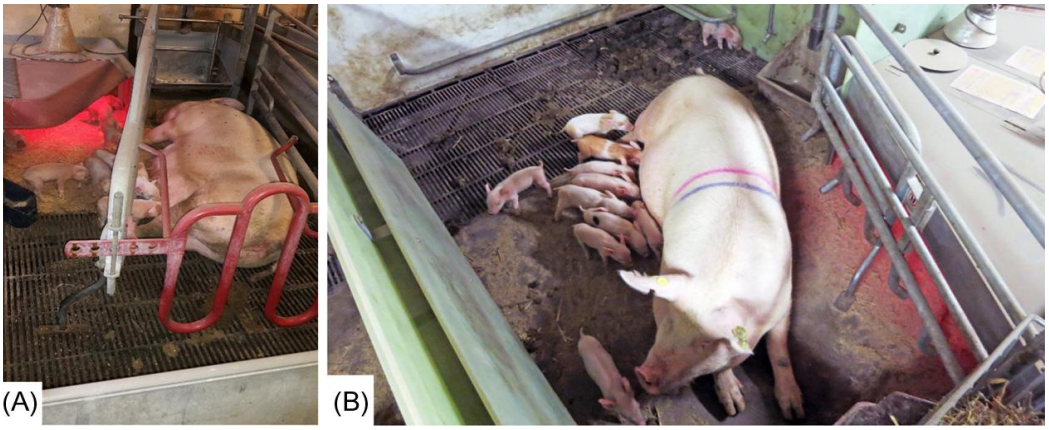


Figure 1: Examples of farrowing pens: (A) farrowing crate with permanent confinement and a covered heated piglet's corner, (B) farrowing pens for loose-housed sows with a covered and heated piglet corner. (Photo: Advances in Pig Welfare, 2018)

Group farrowing:

In nature *"The primary social grouping of pigs consists of two to four sows, their most recent litters and juvenile offspring of previous litters"* (Keeling, et al., 2001). In modern farming, a group farrowing system is when sows are living together in larger groups during the lactation period. The system consists of individual farrowing pens with heated creep box for the piglets, and a common area where the sows can meet and socialize. Separate feeding stalls as well as a dunging area is also included. (Keeling, et al., 2001). This system is mimicking the individual nesting behaviour seen in free range pigs. However, the individual nesting areas are placed much closer together than they would have been in a more extensive habitat. Consequently, this has the potential of leading to a higher mortality rate due to problems like nest invasions by other sows (Jensen, 1989).

Nursing families:

Here the sows are kept in separate pens during the first few days or weeks after farrowing and then moved into groups later on to make what's called piglet kindergartens. Living together like this is believed to reduce the post-weaning stress and have a general positive effect on the piglets. As in the other systems where groups of sows and offspring are kept together, a hierarchy is present in the herd. The dynamics of these systems is maintained

by the individuals lower in ranking avoiding the dominants and thereby also avoiding confrontations (Jensen, 1982).

Free range farrowing:

This is a system where the pigs are kept outdoors, but with small huts or other types of shelter from the environment. This is mandatory in the case of organic pig production in Europe. (Etterlin et al., 2014). Free range sows have the possibility to move around more than those kept in farrowing crates. As a result of this, the suckling frequency of the piglets will decline more rapidly after the piglets are only a few days old. This can result in a lower weight gain compared to more conventional keeping systems (Rantzer, 1993)

2.3 Phases of pig rearing

There are multiple ways to keep the piglets in the period after weaning. These periods are commonly referred to as grower and finisher phases. Depending on the setup of the farm the pigs are either kept in the same groups during the entirety of these phases or regrouped when moved from one compartment to another. In the simplest system, the pigs will stay in the same building from birth and until the day they reach slaughter weight. While on other farms the process can be divided into 2 or more phases (Om gris og grisehold, 2022):

- Bi phased system: The pigs are moved from the farrowing house and into a fattening house.
- Tri phased: The pigs start out in the farrowing house, moved into the weaning house at the point of artificial weaning, and lastly into the fattening house.
- Four phased system: From the farrowing house the pigs are moved into the weaners house, then into the pre-fattening for the period between age 70-120 days and lastly into the fattening house.

With regards to social conflicts, the systems where litters remain together from birth to slaughter age may be advantageous. However this is more of an uncommon way of keeping pigs (Keeling, et al., 2001). Making sure the climate and feed system is adapted to meeting the physical and nutritional demands of the piglets is very important at this

stage of the production (Pedersen, 2018). Being separated from their mother and put in an entirely new environment can be a major stress factor, so avoiding any other unnecessary stress factors is a big advantage for the farmer.

2.4 Housing of grower and finisher pigs

This part of the production is perhaps the one with most diversity in housing and systems used. Choosing a specific system is based on multiple factors such as practicality based on the location, personal experience, and preferences of the farmer etc. In modern farming nowadays it can be said that all farms to a certain degree can be classified as intensive, however we can divide them further into more intensive or less intensive categories (SVC, 1997). The intensive systems tend to have more specialized buildings, where the pigs are kept mostly on slated floors and are kept in pens with smaller space allowances. (Brent, 1986). Common for the less intensive systems is that the pigs generally have a larger space allowance, where the floors often are solid with access to more bedding, like for example in the case of deep litter keeping systems.

Danish-type houses: Uses side wall corridors with pens inn towards the middle and has a centrally positioned dunging channel. The flooring is usually solid, sloping towards the manure channel in the middle of the room. Feed troughs are placed along the opposite side of the pen in the direction of the corridors. (Produktion af grise i Danmark, 2021)

Open stables with heat protected areas: Has lots of bedding available in the resting areas and slatted floor towards the dunging area. These have yards where the pigs can access the outdoor, but with roofs protecting them against the weather. (Om gris og grisehold, 2022)

Fattening houses with totally slatted floors and differences in feeding possibilities. These can use either dry food dispensers or feed throughs. Sometimes the houses are divided into smaller compartments with less animals in each and a central passage. (Om gris og grisehold, 2022)

2.5 Housing of the sow:

Can be either in individual or group keeping systems.

In the period from weaning until pregnancy detection the sows are usually kept in a specific breeding sow house or part of the farm. Here the sows are either kept in individual stalls or groups, with the possibility of contact with the boar. If sows are kept in groups, the farmer should either divide them into smaller "static" groups or leger "dynamic" groups. In the small groups, few individuals are kept together, and new individuals should not be introduced. In case of lager groups there should be a minimum of 60 sows in each pen. The reasoning behind this is that larger groups provide the sows that are lower in ranking or new to the group an opportunity to escape unwanted situations by disappearing in the masses (Grandin, 2010). Or in Earlier the use of tethered housing was used, however due to newer welfare regulations this is now forbidden in most parts of the world. In the EU Directive 2008/120/EC: *"Tethered sows and gilts has been prohibited since 1 January 2006."*

In group keeping systems, the feeding in individual stalls or group feeding can be used when smaller groups are kept together, however individual feeding is usually recommended to avoid dominance fighting, differences in body condition scoring and increased feed consumption. In larger sow groups, computer-controlled feed stations can be used. Different alternatives for bedding can be used, with either none, only using it in the resting areas or using deep litter, like straw bedding in the entire pen. Providing access to good bedding has been proven to have positive effect on both the physical comfort of the sow, as well as reducing the number of injuries (Baxter, 1984). The pigs also seem to spend more time in in the pens when provided with bedding, as compared to pens with no bedding (Beattie et al., 1998).

2.6 Comparison of Norwegian and EU legislations related to pig husbandry systems

In 1965 because of the farming systems becoming more and more intensive, the Brambell report proposed a number of "freedoms" to try and set a standard within the animal welfare aspect of farming. Since then, these freedoms have been modified into becoming what is commonly referred to today as the Five freedoms:

1. Freedom from Hunger and Thirst - by ready access to fresh water and a diet to maintain full health and vigor
2. Freedom from Discomfort - by providing an appropriate environment including shelter and comfortable resting area
3. Freedom from Pain, Injury or Disease - by prevention or rapid diagnosis and treatment
4. Freedom to Express Most Normal Behaviour – by providing sufficient space, proper facilities and company of the animal's own kind
5. Freedom from Fear and Distress – by ensuring conditions and treatment which avoid mental suffering

(Marchant-Forde, 2009)

Norway is not part of the EU, however du to trade between them and the member countries, a lot of similarities in the laws and regulations can be observed.

When discussing laws in the EU and countries trading with the EU, it is important to first distinguish between regulations and directives, which are different forms of legislations. *"A "regulation" is a binding legislative act. It must be applied in its entirety across the EU." "A "directive" is a legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to devise their own laws on how to reach these goals."* (Types of legislation, 2022)

Animal welfare laws in general

General laws regarding the welfare of the animals can be found in the Norwegian law called **LOV-2009-06-19-97**. Since Norway does not have a separate law for the keeping of farm animal in general, this will be the closest equivalent to the **Council directive 98/58/EC of 20 July 1998** *(see table 1 for comparison).* Due to the broader spectrum of species including in the Norwegian version, not all the laws are of importance to the farming industry.

Both the Norwegian law and the EU directive focuses on making sure that the owners of the animals are aware of their responsibilities to ensure the welfare of the animals, and that the keepers working with them are capable of performing their tasks. Both laws

also mention that adequate monitoring of the animals is of importance, to make sure the animals are healthy and shows normal behaviour.

From article 6 in the council directive and paragraph 30 in the Norwegian law, we can see that both have rules set with regards to regular controls to check the upkeeping with the general rules regarding animal keeping.

Comparison of animal welfare laws in general		
Law:	**LOV-2009-06-19-97** – Law regarding animal welfare	**Council directive 98/58/EC of 20 July 1998** - Concerning the protection of animals kept for farming purposes:
What is the goal of the law?	The goal of this law is to promote good animal welfare and respect for animals. **§3.** The animals in themselves have their own intrinsic value, apart from their usefulness to humans. The animals shall be treated well and protected from unjustified stress and tension.	This Directive lays down minimum standards for the protection of animals bred or kept for farming purposes and does not include other animals wild or in captivity.
Which animals are included?	It covers conditions affecting the welfare of or respect for mammals, birds, reptiles, amphibians, fish, cephalopods, squids and honeybees.	In this directive the term animals is defined as: *any animal (including fish, reptiles or amphibians) bred or kept for the production of*

		food, wool, skin or fur, or for other farming purpose"
Competence of the owner/keeper:	**§6**. The owner is responsible for making sure the animals are taken care of by competent keepers, and that other personnel have the proper skills to perform their tasks. **§8.** The owner shall make sure that the mode of operation, methods, equipment and other technical solutions used on animals are suitable with regards to the animal's welfare.	The definition of an owner/keeper in this directive is: *"any natural or legal person or persons responsible for or in charge of animals whether on a permanent or temporary basis"* **Article 3** The owners/keepers are responsible for ensuring a good welfare standard for the animals. Where no unnecessary pain, suffering or injuries are inflicted on the animals. The member state shall take measures to ensure this is being upheld. The animals kept in husbandry systems shall be inspected at least once daily, and cared for by staff with the sufficient knowledge and abilities (from annex).

Requirements for the living environment of the animals:	**§23.** The owner/keeper shall make sure animals are kept in environments ensuring their good welfare based on species specific and individual needs, and giving them the possibility to perform stimulating activities, movements, rest and other natural behaviours. The animals' surroundings shall promote good health and contribute to safety and well-being. No unnecessary pain, suffering or injuries shall be present on the farm.	**Article 4** *"Members States shall ensure that the conditions under which animals (other than fish, reptiles or amphibians) are bred or kept, having regard to their species and to their degree of development, adaptation and domestication, and to their physiological and ethological needs in accordance with established experience and scientific knowledge, comply with the provisions set out in the Annex."* The lighting available shall be adequate to ensure the animals can be thoroughly inspected at any time (from annex). The animals shall have the freedom of movement and must not be restricted in a way that causes unjustified suffering. They must not be confined in such a way that will prohibit them from fulfilling their physiological and ethological needs (from annex).

Control measures from competent authorities:	**§30.** The Norwegian Food Safety Authority conducts supervision and can take the necessary individual measures to achieve compliance with decisions made in or pursuant to this law. Breaking any of the above laws either knowingly or unknowingly are punishable with fines and/or prison up to 1 year, or in case of serious infringements up to 3 years in prison.	**Article 6.** Informs us that the competent authorities shall perform inspections to check that the farmers are complying with the directive.
Health status of the animals:	**§24.** The animal keeper must ensure that the animals receive good care and proper supervision, this includes ensuring that: **a)** feed, pastures, and water are of good quality, meet the animal's needs for nutrition and fluids and promotes good health and welfare. The animals must not be force-fed or forced to drink, unless due to animal health reasons	**Annex:** If any of the animals show signs of sickness or injuries this must be taken care of without delay, and a veterinarian shall be consulted if needed. These animals *"shall be isolated in suitable accommodations with, where appropriate, dry comfortable bedding."* Records regarding the animals' medical treatments and number of mortalities on

	b) Animals are protected against injury, disease, parasites and other dangers. Sick and injured animals must be given proper treatment and euthanized if necessary **c)** the spread of disease is limited, and **d)** animals, where relevant, are sufficiently tamed so that they can be handled and taken care of in an animal welfare responsible manner.	the farm shall be kept for a period of at least 3 years. These records *"shall be made available to the competent authorities when carrying out an inspection or when otherwise requested."*

Table 1: Comparison of LOV-2009-06-19-97 and Council directive 98/58/EC

In contrast to its closest Norwegian counterpart, the Council directive 98/58/EC of 20 July 1998 also includes further points in its annex regarding materials used for buildings and the keeping of animals outdoors:

- Materials used for the buildings and accommodations shall not cause any harm to the animals. Special care shall be taken concerning the materials used to build the pens or equipment which will be in direct contact with the animals. It is also important that the materials are easy to clean and disinfect. No sharp edges or protrusions that can cause damage to the animals shall be present. *"Air circulation, dust levels, temperature, relative air humidity and gas concentrations must be kept within limits which are not harmful to the animals."* Further it is not allowed to keep animals indoors in permanent darkness or without the addition of appropriate artificial lighting whenever natural lighting is not sufficient to meet the needs of the animals.

- Animals kept outdoors shall when necessary and possible have access to adverse protections from the weather, predators, and other risks to their health.

The topics from annex 11 and down in the council directive will not be mentioned in the general part, as their content is described in more details in the laws specific to pig keeping instead. This includes certain physiological needs with regards to the buildings, access to feed and water, breeding etc.

Laws specified to the keeping of pigs:

In contrast to the EU, Norway has put down specific rules concerning the numbers of pigs allowed on a farm (**LOV-2004-01-16-5).** Due to this, pig farms in Norway in general are a lot smaller than in other countries in Europe:

LOV-2004-01-16-5 – law regarding swine- and poultry production

The purpose of the law is to facilitate the spreading of pig and poultry production on several units, by regulating the number of animals produced on each farm.

"Without a license from the ministry, no one can produce a number of pigs or poultry larger than the King has decided."

What this means in practice is that in Norway there is a maximum number for how many pigs can be produced on the farm in the span of a year. The current number stands at 2100 slaughter pigs per year, or a total of no more than 105 sows present on the farm at any given point. (Matdepartementet, 2019) By placing such restrictions, the government hopes to facilitate agriculture across the country.

FOR-2003-02-18-175 – regulation on the keeping of pigs and **Council directive 2008/120/EC** of 18 December 2008 - Laying down minimum standard for the protection of pigs:

The purpose of the regulation is to create conditions for optimal health and welfare in pigs and to ensure that the animals' natural needs are being met.

When keeping pigs, the animals' behavioural and physiological needs must be taken into consideration, and the animals must be protected against the risk of unnecessary

stress, pain and suffering. The breeding shall facilitate good function and health of the animals. This is a very important aspect of both pig- and animal keeping in general and has already been mentioned in both the EU and Norwegian general laws mentioned above. The owners and others with responsibility for the pigs here too must have necessary knowledge of the animal's behavioural and physiological needs, husbandry systems and the content of this regulation. The owner is responsible for ensuring that all personnel handling the animals have the necessary competence to handle the animal in a good way. The pigs shall also be accustomed to humans from an early age, making them easier to handle (§4, 5 and 6. FOR-2003-02-18-175).

The operational setup of the farm must be arranged so that the pigs are given good opportunities for movement, exercise and normal behaviour. The rooms must be designed and furnished so that the animals are not harmed or harm themselves. (§7. FOR-2003-02-18-175)

The entrance to the animal's room shall be equipped with a biosecurity area with a well-defined clean and dirty zone to prevent transmission of infection and ensure good hygiene. Adjacent to the exit/entry there must be a suitable place where the personnel can change clothes, wash themselves and clean equipment. There must be a suitable space that ensues that the loading and unloading of animals can take place in a safe manner with regards to animal protection and without the risk of contamination.

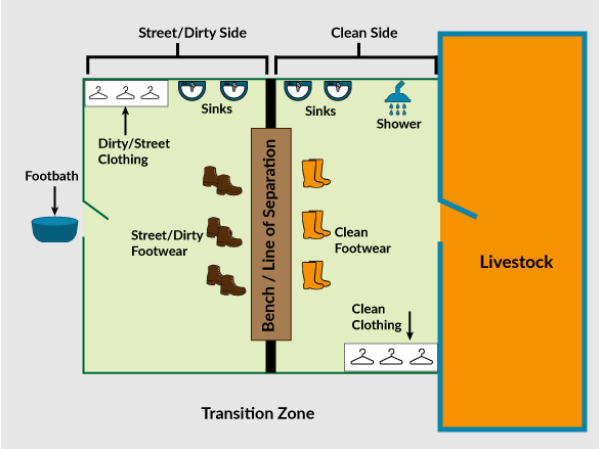


Figure 2: Example of a Danish set up with outside entry from the left. (Sanitation, 2022)

Materials used in animal rooms shall and furnishings that the pigs come in contact with must not be harmful to the animals and must be possible to clean and disinfect in a practical way. Using electricity to divide the pens or in other ways limit the movement of the animals indoors, is not permitted.

Pens and flooring: (§8. FOR-2003-02-18-175)

The pigs must have access to a comfortable, dry, clean, and draft free sleeping area with the right temperature. They must be able to lie down, rest and get up normally.

They shall have a separate eating/lying area and dunging area. The design of the pens shall be in a way that it is possible to use litter. The floor must have a flat, not smooth surface and in the sleeping area a solid floor, deep litter or tallow shall be used. It is important that this area is large enough so that all the animals can sleep simultaneously. Apart from the sleeping areas, the rest of the floor can have drainage.

Pigs must be housed so that they can see, smell, and hear other pigs. The exception being sows which can be kept out of sight of other pigs in the last days before expected farrowing.

When pigs are kept in groups, precautions must be taken to prevent fights that go beyond normal behaviour. Pigs that are particularly aggressive, or have been attacked by other pigs, are sick or injured, must be housed temporarily in individual pens or smaller groups when considerations of animal welfare dictate this. In this case almost the same wording is also used for the EU council directive.

Pig buildings must have separate pens for sick animals and animals that need extra supervision. For fattening pigs and sows, there must be at least one sick pen per 50 animals. It must be ensured that animals in sick pens have sufficient warmth and bedding, and access to water and feed is ensured.

When slatted floors are used for pigs, the width of the slatted plank and the room between them must follow certain criteria, these measurements can be seen compared to the EU council directive in table 2, further down.

Unless the health or welfare of the sow and piglets are negatively affected, no piglets shall be weaned from the sow before the age of 28 days. This law is common for both Norway and the EU.

Interventions and medical treatments:

Here there are some significant differences between the EU and Norway. In Norway all interventions that are not used with the purpose of treatment or making a diagnosis are prohibited. However, in the EU some exemptions exist (2008/120/EC):

- *"a uniform reduction of corner teeth of piglets by grinding or clipping not later than the seventh day of life of the piglets leaving an intact smooth surface;*

boars' tusks may be reduced in length where necessary to prevent injuries to other animals or for safety reasons." In Norway, the rules state that if necessary, the teeth can be filed down with a suitable tool, providing that it leaves an undamaged, even tooth surface. Cutting the teeth however, is strictly illegal.

- *"Docking of a part of the tail"* This can only be performed with the presence of medical indication and only on certain individuals. If this is the case, the procedure must be performed by a veterinarian using anaesthesia and with long-term pain management.
- *"Castration of male pigs by other means than tearing of tissues."* The castrations of pigs in the EU before the age of 7 days, can be performed without the use of anesthesia or prolonged analgesia. In Norway however, the age of the piglet does not play a role in this, and the use of anesthesia and prolonged analgesia is always needed.
- *"Nose-ringing only when the animals are kept in outdoor husbandry systems and in compliance with national legislation."* This is no longer legal in Norway

Fixation and taking samples:

The fixation of pigs in Norway is not allowed, with the exemption of a few cases:

- In connection with feeding
- In connection with veterinary treatment/insemination
- In particularly restless animals during heat
- In particularly restless sows from time of farrowing and up until 7 days after.

In Norway fixation by using tethering is not allowed, this is also a common trait in the EU according to article 3, point 3 in the Council directive 2008/120/EC.

Council directive 2008/120/EC, article 3:

1. "*Member states shall ensure that all holdings comply with the following requirements:"*

a) states the minimum unobscured floor area available to each weaner or rearing pigs (excluding gilts after service and sows) – see *Table 2* for exact numbers and comparison to Norwegian rules

b) When kept in groups the available unobstructed floor area for gilts after service must be at least 1,64m^2 while sows need at least 2,25m^2 each. If there are less than 6 animals being kept together this number be increased by 10%. If, however there are more than 40 animals, it can be reduced by 10%.

Live weight	Minimum m^2 in the EU	Minimum m^2 in Norway
Up to 10kg	0,15	0,15
10-20kg	0,20	0,20
20-30kg	0,30	0,35
30-50kg	0,40	0,50
50-85kg	0,55	0,65
85-100kg	0,65	0,80
Over 100kg	1,00	1,00

Table 2: Comparison of minimum m^2 needed per kg live weight in the EU and in Norway (put together from §26 FOR-2003-02-18-175 and article 3 in Council directive 2008/120/EC)

2. Member States shall ensure that flooring surfaces comply with the following requirements:

a) for gilts after service and pregnant sows: a part of the area required in paragraph 1(b), equal to at least 0,95 m^2 per gilt and at least 1,3 m^2 per sow, must be of continuous solid floor of which a maximum of 15 % is reserved for drainage openings;

b) When concrete slatted floors are used for pigs kept in groups:

When it comes to minimum slat width and the maximum room between them, the Norwegian and EU rules are more or less identical, with the exception of the maximum width for gilts after service and sows being 2 mm less in Norway compared to the EU *(See Table 3).*

Maximum width of the openings must be:	EU	Norway
Piglets	11 mm	11 mm
Weaners	14 mm	14 mm
Rearing pigs	18 mm	18 mm
Gilts after service and sows	20 mm	18 mm
Minimum slat width must be:		
Piglets and weaners	50 mm	50 mm
Rearing pigs, gilts after service and sows	80 mm	80mm

Table 3: Comparison of maximum width of openings in slatted floor (combination of FOR-2003-02-18-175 and Council Directive 2008/120/EC)

3. Materials and methods

A questionnaire consisting of in total 32 questions, was used to gather information about how the farmers themselves experience the welfare standards within the pig industry today. The questions where mostly multiple choice, but with an option to add further alternatives if the farmer did not feel that any of the above alternatives where representative from their point of view. There were also a few long answer questions. Here the farmers were encouraged to write a bit about how they feel about certain aspect of the industry, and what they think the future might bring. The questionnaire was divided into 6 parts including a general part, keeping of pigs, feeding, breeding, welfare, and the future of pig keeping.

The questionnaire was shared on social media platforms like Facebook, in groups related to pig farming in Norway as well as in other international groups and forums. It was available to the farmers in a time period of 4 weeks, between the 24th of April and the 15th of May 2022. And the results are based on what the majority of farmers answered on the different questions.

4. Results and discussions

4.1 General introduction of the farms

A total of 95 farmers took the time to answer the questionnaire. Although it was shared in a great number of forums/groups both international and in my home country Norway, only Norwegian farmers took the time to answer. Therefore, the spectrum of producers that I wanted to reach was not as broad as I initially had hoped for. Still, the ones who did reply came from lots of different backgrounds with some larger scale farms, some middle sized and other hobby farmers with only a few pigs. Therefore, I do believe it is a good representation of the Norwegian swine industry.

4.1.1. What is the operational setup of the farm?

The operational setup of the farms differed depending on their purpose. The largest portion of farms were adapted to buying weaned piglets from breeding farms, and raising them until slaughter weight. The all-inn, all-out system was used here to maintain good hygiene and make the production as effective as possible. The second most common system where the commercial farming system with the production of both breeding and fattening animals. Here the farmer would replace the breeding gilts which no longer where suited for production with younger ones produced from their own stock. The other systems commonly used by the farmers where: commercial farming where the farmers buy the breeding animals, or breeding farms producing either boars/gilts for sale or piglets. A comparison with the number of farms using the different setups can be seen in the figure below.

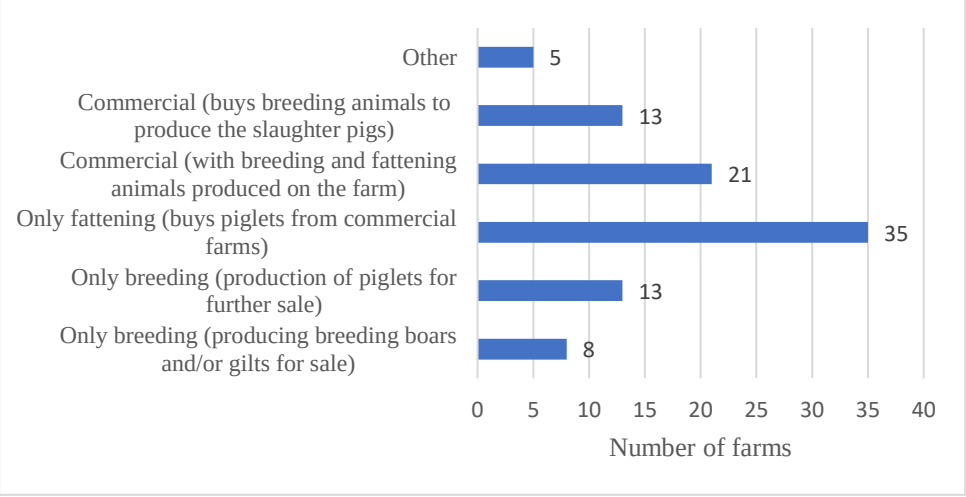


Figure 3. Operational setup of the farms: based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

4.1.2 Which breeds where used on the farm?

Almost 50% of the producers asked in the questionnaire uses a mix between the two breeds Yorkshire and Norwegian Landrace, which is called TN70. This specific mix has been bred by the company Norsvin, which is cooperation owned by the Norwegian farmers. Norsvin represent the farmers interests in political cases but are also performs important breeding work. They provide a good framework for the Norwegian swine industry, by continuously trying to improve the genetic material available for the farmers. Nowadays the organization has become international through the company Topig Norsvin, and export of genetic materials can be found worldwide. The main goal of the organization is to fulfil societies demands for sustainable pig production which to them is characterized by good health and fertility, robust exterior and weaning of large viable litters (Norsvin, 2022).

The second most common answer, with a bit over 30% of the farms was the production of another mix-breed called Noroc or sometimes also known as Edelgris. This pig is a mix between 3 different pig breeds, where the sow is a cross between Norwegian landrace and Yorkshire and the boar is a purebred Durock. According to a professor in animal breeding Odd Vangen at the Norwegian University of Life Sciences/NMBU, using a sow that is a mix of Norwegian Landrace and Yorkshire gives better fertility and more robust than the purebred ones. The mixing with Duroc also gives a better quality to the meat, with more fat incorporated into the meat. (Edel vitenskapelig årgang, 2017)

Other breeds used by the farmers listed from most to least used by the farmers includes: Duroc, Norwegian Landrace, Hampshire, Mangalitsa, Yorkshire, one farm with Norwegian Dølagris and one farm with a pig/wild boar mix.

4.1.3 On average how many fattening pigs are produced on the farm in the span of 1 year?

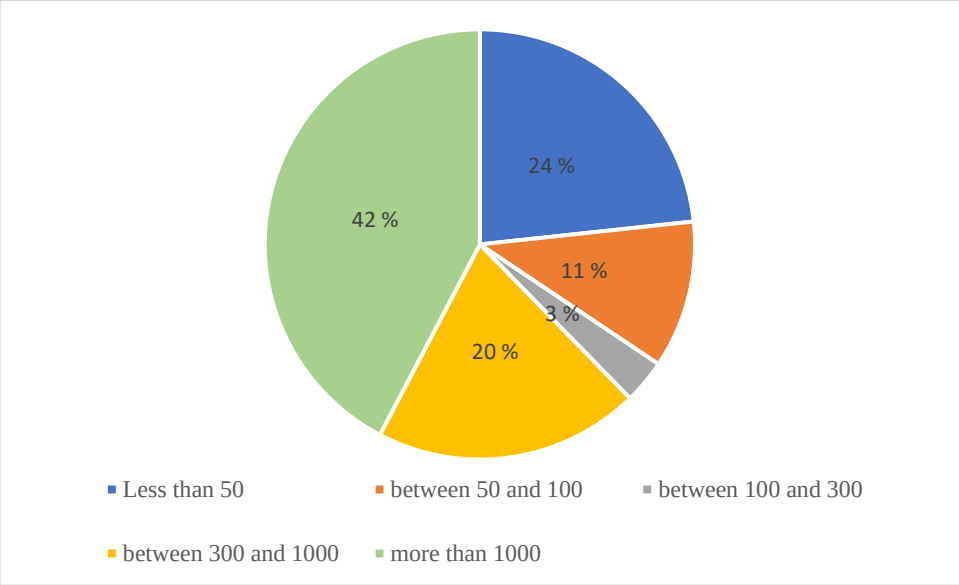


Figure 4. Number of fattening pigs per farm based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

4.2 Keeping of the pigs

4.2.1 Are the pigs kept strictly indoors, outdoors or a combination?

The result showed that 67 (70%) of the farmers keep the pigs strictly indoors, 18 (19%) kept them outdoors and 8 (8%) had a combination where the pigs could choose to be either indoors or outdoors all year around or were kept indoors during the winter periods and outside the rest of the year. Further 2 people taking the questionnaire chose not to answer this question.

4.2.2 What in your opinion is the biggest advantage of outdoor and indoor pig keeping systems?

The farmers were asked to choose what they thought where the most important reasons (up to 3 alternatives could be chosen). Some suggested answers where added inn, but they also had the option to add new alternatives if they felt something was missing.

The answers were as follows:

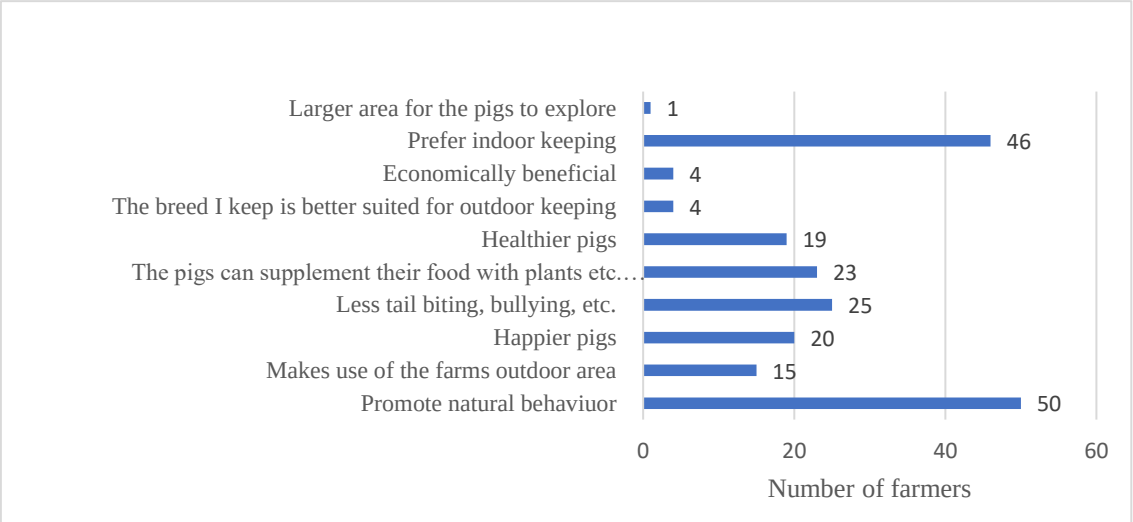


Figure 5. Advantages of outdoor pig keeping, based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

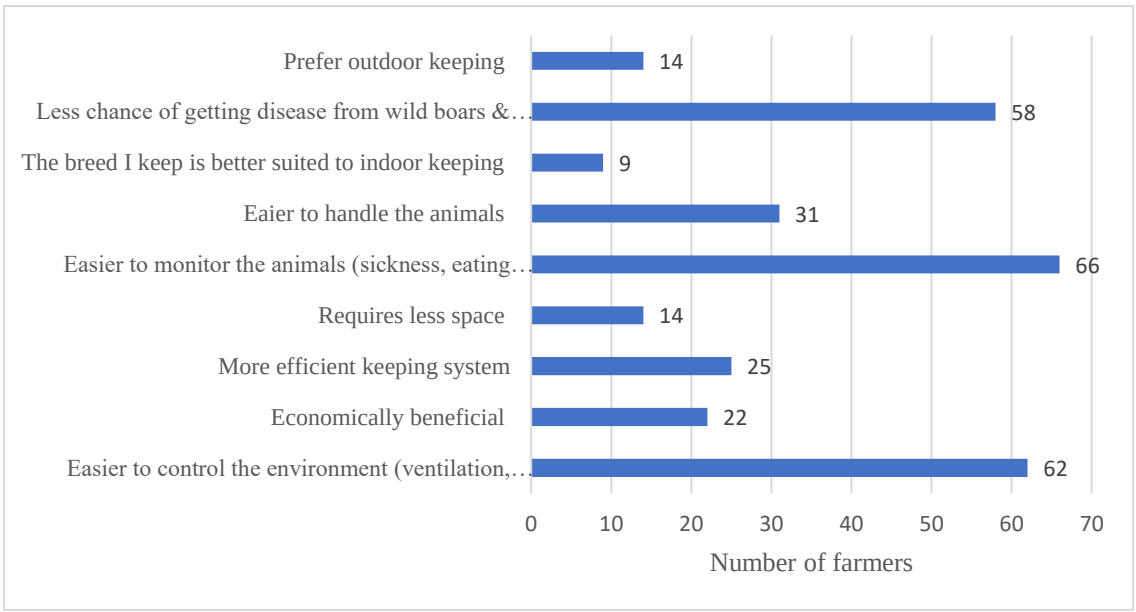


Figure 6. Advantages of indoor pig keeping, based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

4.4.3 Which type of litter/bedding do you use indoors?

Wood shavings or coarse sawdust was the most common answer here. 73 of the farmers used this either alone or in combination with straw and hay which was the second most used alternative by 64 of the farmers. 32 answered that the used shredded paper, this was also used either alone or in combination with other types of bedding. Some farmers supplemented the bedding with rooting materials like turf, silage to keep the pigs more mentally stimulated.

4.4.4 Lighting and ventilation on the farm

The lighting on the farms mostly consisted of a combination of natural light (from windows etc.) together with artificial lighting patterns, with a total of 76% of the farms using this method. 18% used only natural light sources, while only 5 farms had artificial lighting as their only source of light.

The ventilation systems consisted mostly of mechanical fans (62%), some using natural ventilation like windows or openings along the roof of the building (20%) and some using a combination of the two.

4.4.5 Are you satisfied with the type of accommodations you have, or is there something you would like to change?

In majority of the cases the answer here was simply yes. Other replies where:

- "I want to change the design of the breeding pens, so that the grouping of sows can be improved"
- "I'm satisfied, but wish I had a bit more enclosures, so I don't have to mix the sows as much"
- "I'm happy with the pens. The system used in the dunging area however functions badly because of the large amounts of litter getting stuck and blocking it especially during the period around farrowing."
- "We are in constant development, and so is the interior of the farm. I would have like to try out new options for some compartments."
- "Would like to have the same number of pigs but with larger pens"
- "Satisfied. The farrowing pens are getting a bit too small due to the fact that the litters are increasing, and so are the numbers of piglets weaned"
- "Satisfied, however I always wish I could have more space for the animals"
- "Larger pens, better feeding areas and the possibility to have a gate/door between the pens so I don't have to go back out into the hallway to reach the next one."
- Not satisfied, as the farms old and well worn. I wish to build a new one this year, but due to economic reasons I don't see it happening in the nearest future. The more pigs together in larger areas, the better is my experience!"

- "Old enclosures from 2000, would prefer larger pens, especially the farrowing pens should be larger than $9m^2$"
- "Should be more robust. Considering making a concrete wall between the pens"
- "No, I bought the farm on the open market. The interior is old, used to produce slaughter pigs, so a lot of it does not meet the requirements for sows. We spend hours every week on maintenance and reparations."
- "Would like a system that makes it easier to separate the pigs when we deliver some to the slaughterhouse etc."
- "I'm happy with it. Would like some bigger farrowing pens, change the design of the pens for the fattening pigs and bit wider space in the wire mesh of the flooring. Old farmhouse which was expanded and with updated interior. Biggest flaw is that it was built in a way that is not adapted to handle the current electronic requirements of the farm."

4.3 Feeding of the pigs

4.3.1Which type of feeding system is used for the sow?

Majority of the sows where fed at the same time on a long feeding trough, while the others used either individual feeding in separate stalls or a combination of the two. For the farmers having the sows outside, simultaneous feeding for the entire herd was used, either by using a long trough like in the indoor system, or by simply spreading the food around the enclosure to make sure all the sows where able to get their share without having to compete for it.

4.3.2 Do you ever observe the sows biting excessively on their enclosures, or chew without food in their mouth?

Excessive biting also called sham chewing, according to the farmers where not a very prominent problem. 30 of the farmers answered that they have never observed this behaviour from any of their sows, while 32 said that it only happened very rarely. 11 people said it happened every now and then, but only to some individuals, while only 1 person replied that this kind of behaviour was observed on an almost daily basis.

4.3.3 Do your fattening pigs ever compete for the food during feeding time?

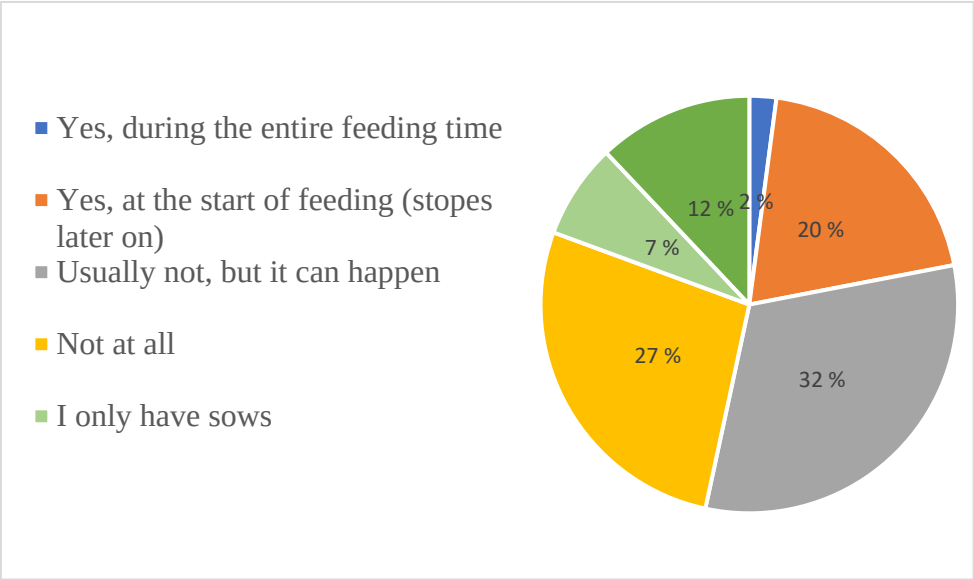


Figure 7. Competition among the fattening pigs: based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

4.4 Breeding

4.4.1 Which farrowing/birthing system do you use on the farm?

Mostly individual farrowing stalls with a separate creep area was used on the farms. Because most of the farmers kept only fattening animals, if we exclude these the second most common answer was that the sows were kept in larger groups outside. As Norway has very strict laws when it comes to fixation of the sows during the farrowing/weaning period (and in general), only 3 of the producers uses pens with any kind of fixation. One farmer kept his sows in groups indoors after birth.

One of the farmers using outdoor farming in general, chose to separate the sows in a smaller area around the farrowing to have better control of where the piglets are borne. The sows then get approximately 1 acre of land each that is separated with access to their own hut with nesting material for them to use. Another one uses a method where he takes the sows inn right before farrowing and keeps them indoors for a few days to make sure all the piglets are fed and can follow their mother.

On one of the farms the farmer used both indoor and outdoor keeping during farrowing. “Usually, the sows giving birth indoors is placed in separate pens for the first couple of days and then put together in smaller or larger groups. However, in my experience having them in groups during the farrowing too is normally no problem. The few times I have had farrowing outdoors the same methods has been used.”

4.4.2 In your opinion, what is the most important traits we should focus on when breeding pigs?

The general answers can be seen in the table below. A couple of the farmers agreed that all the alternatives below are important, having a broad goal for the breeding where one would try to include all of them would be preferable.

"Having a focus on the mental state of the pigs where the pigs feel safe and trust the keepers is the most important part for me. If this bond is present, a lot of other stress related problems will naturally also disappear."

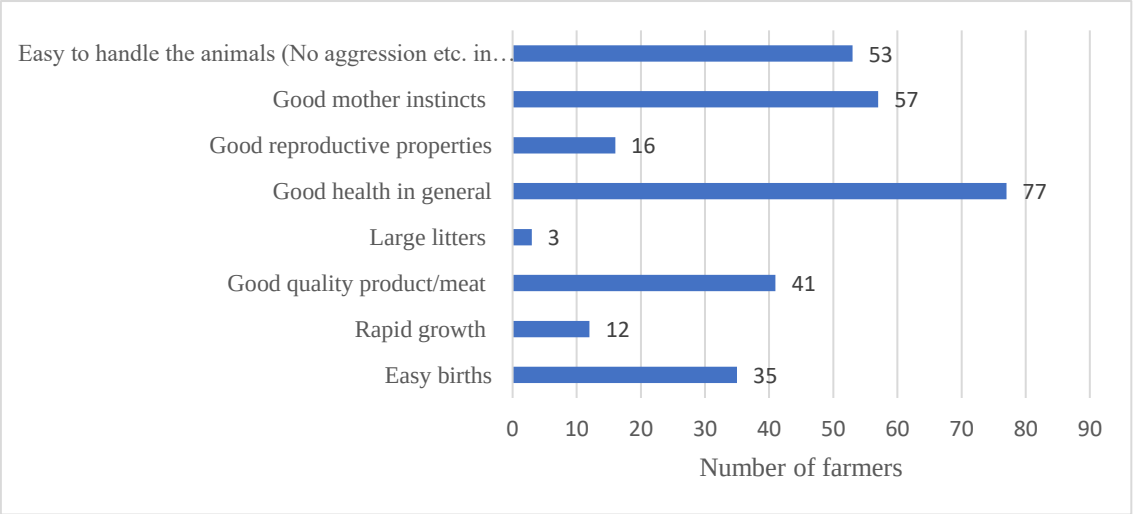


Figure 8. Most important traits to breed for in pigs: based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

4.5 Pig welfare

4.5.1 Which type of enrichments do you have on your farm to keep the pigs entertained?

A great variety of toys made from chains, wood, hard plastic etc. was mentioned by the farmers. Others used fruits, bread, vegetables, and other edibles to entertain the animals. For the farmers with outdoor keeping systems, the pigs use the natural habitats of the area, with some of the farmers using the pigs to maintain the cultural landscape and keep vegetation down, and others including forest areas into the larger enclosures.

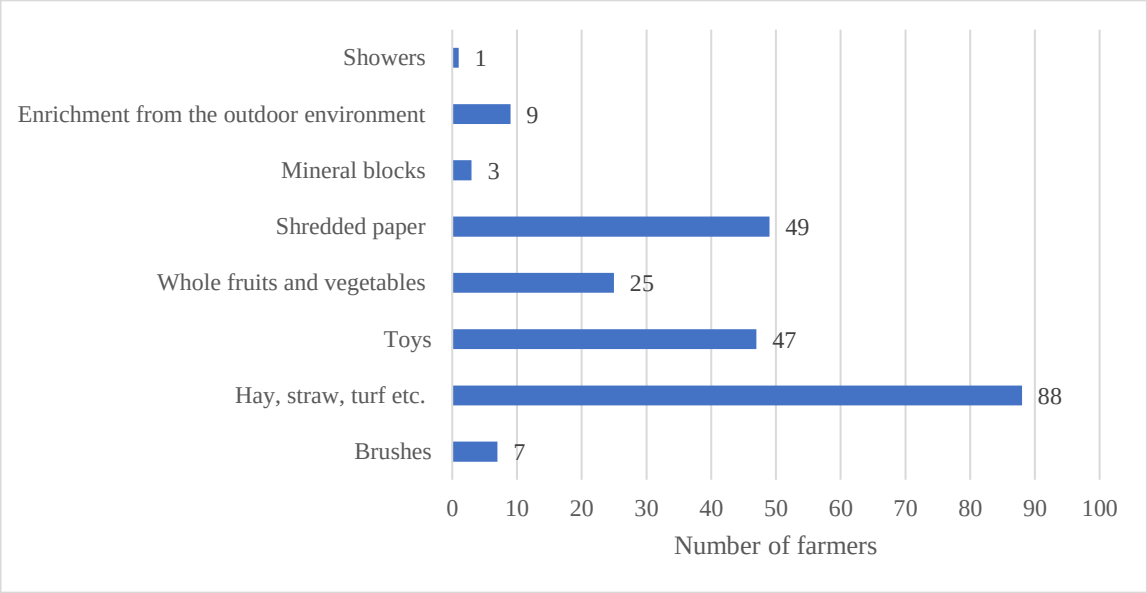


Figure 9. Most commonly used environmental enrichments: based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

4.5.2 Do you think that enrichments are an important criterion to maintain a good environment for the pigs?

- "Yes, especially hay/straw/silage is popular among our pigs"
- "Environmental enrichment is important both for the welfare of the pigs and as an important precaution for problems like tail biting. However, keeping of a good temperature, moisture and the number of pigs is even more important."
- "Absolutely, here the pigs live outside the entire year, and I can see the importance for the pigs to have something to do. They don't eat a lot of hay when I give it to them, but to drag it out across the area and play with it is great fun for them. When the pigs get fruits and vegetables, they are so happy!"
- "Having something to do makes the time go so much faster and greatly reduces bullying and tail biting."
- "Yes. The joy they show when given shredded paper/cardboard with their tail waging is proof enough for me. The pigs are so curious and trusting whenever I enter the pens."
- "When keeping pigs indoors it is a necessity to prevent boredom. Outdoors they can dig, run etc."

- “The pigs require a lot of activation to thrive. None of my outdoor pigs have problems with tail biting, however this used to be a problem earlier when I had them indoors in smaller pens.”

These where some of the answers from the questionnaire. Lots of other similar answers were sent in too, however they all mostly focus on the same aspects and agreed that environmental enrichment is an essential part of modern pig keeping. The pigs being social and intelligent animals need enrichments as part of their habitat to avoid behavioural problems and for them to satisfy their need for mental stimulation. To quote one of the farmers “Satisfying the mental need of the pigs makes for happier pigs. Happy pigs = happy farmer!”

4.5.3 How often would you say tail biting occurs at your farm?

34 of the farmers answered that this has not been a problem on their farm at all, while 53 of the others said that less than 3% of the population of pigs were showing signs of tail biting. Five answered that between 3 and 5% of the pigs were affected and only 2 answered between 5-10%.

On my questions regarding whether cropping of tails where a common practice at the farm, the answer where quite unanimous as all my answers cane from Norwegian farmers. The practice of cropping tails is prohibited by law, so none of the farmers asked have any procedures for this. Therefore, the questions related to tail cropping is not discussed in this part of the thesis.

4.5.4 How often would you say ear biting occurs?

The overwhelming majority of almost 90% of the farmers answered that this has not been a problem at their farm at all. The remaining farmers had this problem in less than 3% of the animals, except one farm which answered that it could be seen in between 3-5% of the pigs.

4.5.5 Which precautions do you think should be used to avoid problems with tail and/or ear biting?

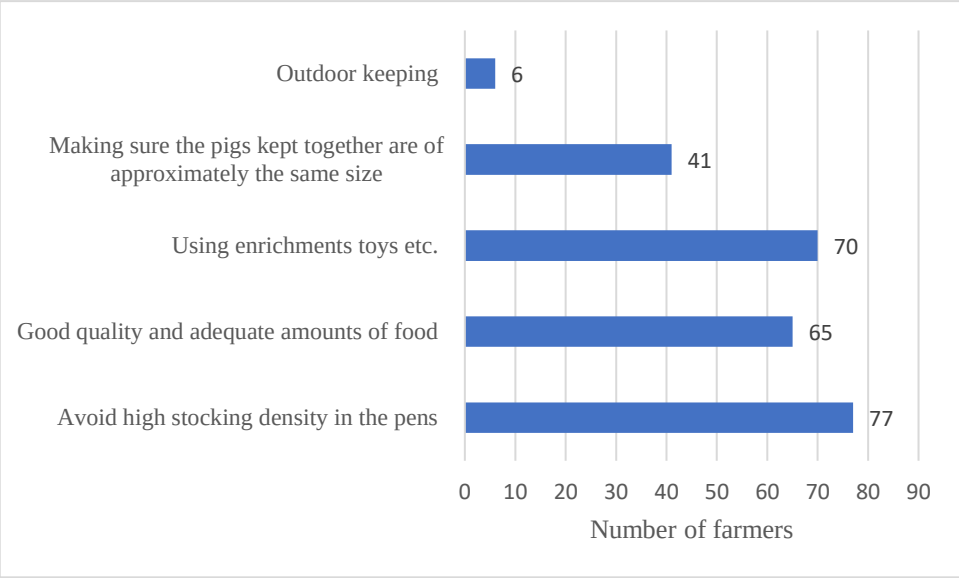


Figure 10. Measures to prevent tail/ear biting: based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

Other measures mentioned was to make sure the enclosures are built in a way that provides the pigs with the possibility to run away from the bullies, meaning not too small enclosures etc. *"Let the piglets stay within their litters when weaned and avoid mixing different ones as this can lead to fighting to determine the social ranking in the newly formed herd. This can easily lead to wounds on the piglets."* Adequate ventilation and maintaining a good and stable temperature were also mentioned.

4.5.6 What do you do about pigs that are born with or develop umbilical hernias?

Half of the farmers answered that they will try to fatten them up together with the other pigs and send them to the slaughterhouse when old enough. Usually, the pigs with hernias would be slaughtered a bit earlier than the other pigs to avoid them getting worse. Others however would either euthanize them at birth if signs of herniation or at a later stage if the hernia got bigger, and a few would keep the pig for their own consumption due to the slaughterhouse not accepting them if the hernia is too large. Around 8% had used medical/surgical treatment using veterinarians to solve the problem if the hernia was not too large.

Around 10% of the farms had not encountered this problem yet and therefore chose to answer blank.

4.5.7 How often would you say it happens that the sow will lie down on their piglets and crush them (overlying)? And which precautions do you take to prevent it?

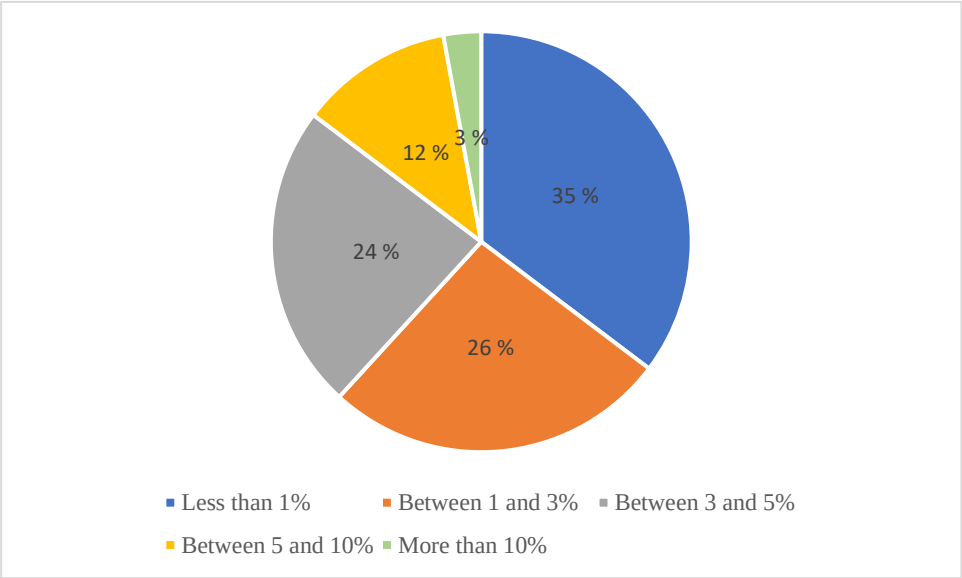


Figure 11. Pig mortality due to overlying: based on the results of thesis questionnaire: comparison of different pig husbandry systems in terms of animal welfare

The top 3 precautions taken was:

1. Having a separate creep area with heating for the piglets where the sow doesn't have access

2. Having a barrier between the walls of the stall and the sow, so she can't lie down and crush the piglets against the wall

3. Removing the sows that are indifferent to the piglets from the breeding program (poor motherly instincts)

Other methods used was among others to make sure the floor was not slippery; this is to make it easier for the sow to lie down and get up and making sure the temperature is adequate for the piglets to avoid that they seek proximity to the sow for heating

A lot of the farmers would spend a lot of time checking in on the animals during the period around, and right after farrowing to try and minimize the losses of piglets.

4.6 The future of pig keeping

4.6.1 In your opinion, which changes should be done to improve the pig keeping in your country?

- "Better economic support for the farmers"
- "Work on improving the attitude and knowledge about ethology among the people working on the farms"
- "Stricter requirements for ventilation and area of the enclosures"
- "More focus on outdoor keeping promoting natural behaviour"
- "Increase in requirements when it comes to area available to the pigs"
- "In my opinion, if the farmers stick to the requirements for pig keeping today, the Norwegian pigs should have good quality lives"
- "More space and environmental enrichments for the pigs"
- "Increased demands when it comes to space and stimuli, and an increased economic support to the farmer. More clear demands for lighting and amount of litter used"
- "More frequent visits from the authorities of animal health and food safety"
- "Restrictions for outdoor keeping due to possible contamination of African swine fever"

Lots of other similar replies were given with regards to increasing the demands of m^2 per pig, more economical support from the government and an increased focus on the animal welfare standards. In general lots of farmers mention that Norway already has a very good standard of welfare among the pigs and only need some minor changes to further improve the already good system that is in use today.

4.6.2 Do you think laws/regulations in your country is adequate to maintain a good animal welfare standard?

In majority of the cases the farmers agreed that the current laws and regulations keep a good standard of animal welfare for the pigs. 6 people found the rules too strict, while 8 people felt like the laws should be even stricter than the ones in use today.

However, some farmers pointed out that the current rules are adapted mostly to indoor pig keeping, so there might be difficulties with enforcing the laws when it comes to pigs living outdoors.

4.6.3 Do you have any opinion as to how the farming systems will change in the future?

Most of the farmers commented on the possibility that regulations in the future will be stricter when it comes to the required m^2 for each pig. *"They might increase the space requirements, and maybe in the future there will also be requirements for the pigs to have the possibility to go outside for certain periods of time. How this will be done in practice I'm not quite sure about."*

The interior design of the farms and requirements for enrichments such as nesting materials etc. was also one of the recurrent themes. The animal welfare aspect of the swine industry has been a popular topic in the social media the last couple of years. Due to this, a lot of the farmers believe that this trend will continue, and the regulations will become stricter in the future.

With all the new regulations and continuous focus on welfare etc., some of the farmers are worried that the costs related to this will make it harder for them to gain a good economic income from the farm. The hope of these farmers is that with the new welfare regulations, the government will grant more support to the farmers. *"If the current trends with high demand from the consumers and the government continues, while the expenses from gas, fertilizer, labor etc. continuously increases, the Norwegian farmers won't be able to compete with the prices of imported meat. This again is no good if we want to be a self-sustained country also in the future."*

4.6.4 Is there anything you want to add?

SPF (specific pathogen free) pigs was one of the recurrent topics here.

- "I'm really hoping that the SPF pigs won't be "favored" and that Norsvin will remain open for the fact that not all of the farmers want to use this kind of breeding. I believe it's not possible to satisfy the pigs needs 100% using this method."
- "SPF is a great initiative to better the welfare in combination with the usage of larger areas and better bedding for the pigs. Outdoor keeping is not the solution."

Advantages with outdoor and indoor pig keeping:

From the information seen in figure 5. (in the result section) we can see that the most common answers with regards to outdoor keeping:

1. That this promotes natural behaviour. This answer was chosen by a total of 50 farmers, including all the farmers having their pigs outdoors, as well as a lot of the other farmers.
2. This kind of keeping is less prone to problems like tail biting, bullying etc.
3. The pigs can supplement their food with plants, etc. that they find outside.

In figure 6. we can see that the most common answers to indoor keeping.

1. Easier to monitor the animals (sickness, eating patterns, etc.)
2. Easier to control the environment (ventilation, heating, etc.)
3. Less chance of getting disease from wild boars & other wild animals

From the questionnaire a total of 46 farmers stated that they prefer indoor keeping, as opposed to 14 farmers preferring outdoor keeping (see figure 5 & 6). My general impression is that the farmers in Norway are very split up in their view of outdoor pig keeping. On one hand, some of the farms with indoor keeping systems would argue this is the best way to keep pigs due to it being more convenient for the owner when handling the animals, and less risk of contagious diseases acquired from the environment around the farm. If the pigs are kept inside, the control of hygiene is much stricter. The farmers have the typical clean- and dirty zones, and guests entering the farm will use boots and clothing belonging to the farm to try preventing any foreign pathogens from getting in. When it comes to outdoor farming however, the animals are exposed to the pathogens present in the area around the farm to a much higher degree. On the other end some of the outdoor farms would argue that the lack of natural stimuli acquired from the outdoor keeping, cannot be compensated for in modern indoor pig keeping.

In 2015, an article comparing the difference in prevalence of different lesions found in organic/free range and conventionally raised finisher pigs where released. The data used

in the experiment was gathered from the meat inspection recording of the Danish slaughterhouse database and set to a period of one year.

The result from the comparison concluded that: *"Compared with conventional pigs, organic/free-range pigs had a higher prevalence of 13 lesion types. These lesions included, among others, fractures, tail lesions, and osteomyelitis. Four lesion types were equally common in the two production systems; among these were chronic pneumonia and chronic pleuritis. Finally, four lesions occurred less frequently in organic/free-range finishers compared with conventional finishers. These included abscesses in leg/toe, hernia and scar/hock lesion."* (Alban, et. al, 2015)

From this we can be established that both indoor and free range/organic keeping systems have their flaws. The question of which one is better from a welfare point of view is therefore not a simple one and can be interpreted in lots of ways.

Tail biting:

"An investigation of the effect of environmental enrichment and space allowance on the behaviour and production of growing pigs"

The use of environmental enrichment and increasing the space available to the pigs, has shown to reduce the amount of nosing and tail biting. In a study from 1996, an inquiry on which factors, enrichments or space allowance had more influence on the pig's behaviour.

The pigs were divided into 5 "treatments" with 4 replicates of each. The pigs used for the experiment where newly weaned 6-week-old piglet groups with 6 littermates in each group. Treatment 1-4 were placed in enriched environments with increasing floor space of 0.5, 1.1, 1.7 and 2.3m^2 per pig respectively. The 5th treatment had the same floor space available as in nr 4, but here there were no enrichments available to the pigs.

The pigs stayed in this environment for 6 weeks. 2 animals per group were chosen (one boar and one gilt) and observed for 10 minutes, twice weekly. The results showed that group 1 and 5 explored less and had a higher degree of inactivity. When the pigs were given more space, more locomotory behaviour was observed. In the 5th treatment without enrichments, more harmful social behaviour could be seen.

In treatment 1,2 and 3 the measured weight gain and feed conversion efficiency showed a tendency of better production performance compared to the other two. This indicated that increasing space allowance beyond 1.1 m2 per pig had no beneficial effect. Therefor this study concluded that enrichment played a greater role in determining pig behaviour than floor space allowance. (Beattie et. al, 1996)

In the EU only three of the Member States, namely Austria, Denmark and Slovenia have currently specific legislation further limiting the practice of tail docking. In Finland, Lithuania, and Sweden the practice has been completely prohibited unless motivated in each individual case from a veterinary perspective. (De Briyne, et. al, 2018)

In accordance with the EU council directive 2008/120/EC routine docking of tails in pigs is prohibited and shall only be performed as a last resort. Despite this tail docking is still a common practice in most of the EU. The article called ***"Why are most EU pigs tail docked? Economic and ethical analysis of four pig housing and management scenarios in the light of EU legislation and animal welfare outcomes"*** which was released in 2015 tries to find the answers as to why this is.

Four different scenarios where compared:

1. The 'standard docked' which means a conventional housing scenario with tail docking meeting the recommendations for Danish production
2. 'Standard Undocked', which is the same as the first one but without tail docking
3. 'Efficient Undocked'
4. 'Enhanced Undocked', which have increased solid floor area, provides rooting material but no tail docking.

The result suggested that the Standard Docked gives the highest economic gross margin with the least tail biting. However, from a legal aspect this is not optimal either as *"Various ethical concerns about tail docking remain: it is a painful mutilation, fails to respect animal integrity and does not address the underlying deficiencies in the environment that increase the risk of tail biting in the first place".*

The experiment concludes that, without first correcting certain aspects in regard to housing and management, a total ban of tail docking would not have the desired effect. Chances are they would have the opposite effect, leading to an increase in tail biting and have a negative impact on the farm's economy. When considering the welfare of the pigs, being bitten can be more painful than the docking itself as it causes repeating pain and can lead to infections. Therefor to achieve the goal of no tail docking and improving the animal welfare, a change in the production systems, perhaps together with selective breeding may be needed first. (D'Eath, 2016)

From the results of the questionnaire compared to the recent articles about tail biting, the prevalence of the problem in most Norwegian farms is not very significant. With most farms stating that the prevalence is less than 3% of their population, these numbers are good when we think about the fact that tail docking is not a common practice in any of them. Data from the extended disease registration, shows that the occurrence of tail wounds, both resulting in shorter tails and open tail ulcers has decreased markedly the last few years. The average numbers have gone from almost 9% in 2017 to around 3% in 2021. This suggests that the efforts put into prevention this far is working.

The future of pig keeping:

In 2019, a documentary with footage taken undercover with hidden cameras from Norwegian pig farms was published on the biggest Norwegian TV channel, and later spread like wildfire on social media. The clips showed dirty pens with injured animals, farmers castrating pigs themselves without anesthesia and other brutal clips. Although this representation is not representative to the entire industry, the reputation of pig farmers was put in a very bad light. Since then, there has been an increasing distrust from the public to the industry, and the focus on pig welfare has exploded!

"Helsegrissystemet" is a Norwegian welfare program that was started by the meat industry to try and improve the welfare and hygiene in the pig industry. Originally it was started with the focus on fattening pigs, but since then it has expanded and has now become a general welfare program for all pigs in the industry. The program sets demand for systematic documentation, regular visits by a veterinarian, a journal system containing information about sick or injured animals and their treatments.

The animal welfare program for pigs is based on five control points for better animal welfare:

- Follow-up of sick and injured animals, including routines for the use of sick pens and correct killing
- Use of litter and rooting material
- Occurrence of tail biting on the animals in the herd and registered at the slaughterhouse
- Housing and animal density
- Feed and water access

By being a part of this program and having an approved establishment, the farmers will get an additional sum when selling their animals. The approval of the establishment is done by veterinarians. The farm will have 1-3 annual controls, depending on the number of pigs present on the farm. where the veterinarian will have a list and go through the welfare of the pigs, considering the 5 control groups mentioned above.

The system is adapted to fit the controversial indoor keeping system. However due to the economical aspect, it is now becoming increasingly more common in outdoor keeping as well. This is still in a developing stage, but the main control points is still similar.

With this program in use, the focus on welfare has increased since it was first introduced back in 2018.

5. Conclusion:

Today's society has a lot higher standard of living compared to the past, and because of our own welfare, we are now seeing an increase in the awareness of animal welfare as well. The consumers are more and more focused on the sourcing of the meat they are eating and due to this the meat industry has had to work a lot to try and keep up with this. Due to the maximum number of pigs to be kept on farms in Norway, the farmers here in general get to know their animals on a more individual level. This often results in the farmers being able to discover disease and changes in behaviour on a different

level than the larger “factory farms” that can be found in other parts of Europe. Making the welfare of these farms somewhat better in my opinion due to this.

The use of enrichments in the pig pens in form of anything from toys, fruits, hay has proven to be an important aspect when trying to get rid of behavioural problems like tail biting, sham chewing etc. This stimulates the pig’s natural behaviour and allows them to use their intellect for exploring and solving problems. This mental stimulation makes for calmer pigs and decreases restlessness and fighting among the piglets.

Both indoor and outdoor pig keeping has its advantages and problems. The pigs living outdoors are freer to express normal behaviour, but at the same time they are also more prone to certain injuries and contamination from the environment around them. However, I did not find a lot of information on this specific topic, so there is room for more research to be done within this field.

From the questionnaire, one can see that the motivation for improving the welfare of the pigs is high. However, a lot of the farmers feel like the economy right now is not good enough to sustain the improvements they wish to make.

All in all, there has been lots of improvements done in the field of pig welfare in the last few years. There is always a potential for improvement, and I believe we will see lots of changes also in the future.

6. Summary

The welfare of pigs is a very important topic for the farmers in the industry and there where lots of responses regarding the topics in the questionnaire.

Having such a wide spectrum of farmers from different backgrounds from the larger farms making a living out of the industry, and all the way down to the small hobby farmers with only a few pigs. Due to the difference background the most splitting question was the one regarding advantages of indoor and outdoor keeping. The main advantages of outdoor keeping were: That this promotes natural behaviour, less prone to problems like tail biting, bullying and that the pigs could supplement their food with plants, etc. that they find outside. On the opposite side, the most common answers to indoor keeping where: Easier to monitor the animals (sickness, eating patterns, etc.),

easier to control the environment (ventilation, heating, etc.) and less chance of getting disease from wild boars & other wild animals.

Although tail biting, bullying etc. was not a very big problem among the farmers from the questionnaire, there was a common agreement that the using of environmental enrichment and making sure the stocking density was not too high was important to try and keep this down

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8. Appendices:

Appendix 1. Electronic licence agreement and copyright declaration

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INTERNATIONAL STUDY PROGRAMS
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Thesis progress report for veterinary students

Name of student: Storevik Lena Hovland

Neptun code of the student: G8AC1O

Name and title of internal supervisor: Dr. Szilvia Vetter PhD., Head of Center for Animal Welfare

Name and title of external supervisor: Dr. Katalin Maros PhD.

Department: Center for Animal Welfare

Thesis title: Comparison of different pig husbandry systems in terms of animal welfare.

Consultation – 1st semester

	Timing			Topic / Remarks of the supervisor	Signature of the supervisor
	year	month	day		
1.	2021.	03.	15.		
2.	2021.	08.	12.		
3.	2022.	03.	03.		
4.	2022.	03.	30.		
5.	2022	04.	01.		

Grade achieved at the end of the first semester: .....5 (excellent).....

Consultation – 2nd semester

	Timing			Topic / Remarks of the supervisor	Signature of the supervisor
	year	month	day		
1.	2022.	08.	30.		
2.	2022.	09.	15.		
3.	2022.	10.	20.		
4.	2022.	10.	24.		
5.	2022.	11.	02.		

Grade achieved at the end of the second semester: ...5 (excellent).....

The thesis meets the requirements of the Study and Examination Rules of the University and the Guide to Thesis Writing.

I accept the thesis and found suitable to defence,

ÁLLATORVOSTUDOMÁNYI EGYETEM Állatvédelmi Jogi, Elemző és Módszertani Központ BUDAPEST

Dr. Szilvia Vörös
signature of the supervisor

Dr. Mrs Kátai-Tóth

Signature of the student: Lena H. Storevik

Signature of the secretary of the department: Melinda B

Date of handing the thesis in 17/11-2022