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IDENTIFICATION OF BEST PRACTISES AND INNOVATIVE IDEAS WITHIN ORGANIC PIG PRODUCTION SYSTEMS IN EUROPE

SUMMARY OF STAKEHOLDER INTERVIEWS

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Outline

1 Summary

Pig production on pasture support the organic principles of natural living and comply well with consumer expectations but pasture access is limited in European pig production even within the organic production. Combining indoor housing and pasture systems might be a way forward supporting animal welfare and reducing the well-recognised high risk of ammonia emissions from concrete outdoor runs.

The overall aim of this report was to support a wider adoption of combined indoor and pasture systems in organic pig production across Europe through presentation of inputs from stakeholders collected across Europe in the Core Organic Cofund project "Proven welfare and resilience in organic pig production" (POWER).

In total 120 organic pig producers, consultants and veterinarians participated in workshops and/or interviews across eight countries (Austria, Denmark, France, Germany, Italy, Netherlands, Sweden, and Switzerland). The participants were asked to point out positive and negative aspects of rearing pigs on pasture and in indoor housing systems with outdoor runs, best practice examples and innovative ideas for further development of organic pig production systems.

The inputs revealed large differences between countries in practice and housing designs. In the majority of countries, indoor housing with access to outdoor runs is the most common system used for sows and growing-finishing pigs. In a few countries, pasture concepts are still widely used e.g. in Denmark and in France (pregnant and lactating sows all year round) and Sweden (all pigs in summer season).

Positive aspects of indoor concepts mentioned were e.g. possibility to control housing climate (moderate temperatures year-round) and to collect manure/nutrients for use in the crop rotation and treatment of individual pigs is easier. On the other hand, negative aspects mentioned were less opportunity for the pigs to perform natural behaviour (e.g. rooting), very expensive to establish, poor hygiene in the outdoor runs and therefore high risk of ammonia losses. With regard to pasture systems, positive aspects mentioned were e.g. that the pigs in general are more robust and healthier with lower infection rates, have very good opportunities to perform natural behaviour, cheap to establish and it gives the production a good image. Negative aspects mentioned where risk of nutrient leaching, lack of shade, muddy soils, heavy workload, difficult to isolate and handle sick animals and concerns about the future situation with African Swine Fewer.

The participants mentioned a range of best practice examples e.g. improving the attractiveness of outdoor runs through implementation of enrichment (rooting facilities, straw and roughage) and thermoregulatory facilities (shade, sprinklers and wind protection) as well as automatic sorting systems to ease weighing and feeding of growing-finishing pigs. Adopting cooling facilities in terms of wallow were mentioned as best practice examples in pasture systems. Furthermore, pasture rotation/integration in crop rotation were mentioned to improve parasite control, maintain vegetation and reduce risk of nutrient leaching.

Many innovative ideas were put forward at the workshops/interviews to improve animal welfare and reduce environmental impacts. It was e.g. suggested to combine the current housing system and the outdoor runs with access to pasture with trees, planting of trees (or other tall crops) close to the outdoor run to provide shade, implementing automatic-controlled covers in outdoor areas adapting automatically to the actual weather situations, and employing a fan that blows cool air below lactating sows when they are standing to cool the sows in hot seasons and to keep newborn piglets away from a risky situation.

In a close cooperation with organic pig producers, future research and innovations are needed to further develop indoor and pasture concepts, respectively, and to explore how to best combine indoor and pasture concepts to "have the best of both worlds".

2 Background and aim

Pig production on pasture support the organic principles of natural living and comply well with consumer expectations but pasture access is limited in European pig production even within the organic production. The Core Organic ProPIG project (https://projects.au.dk/co2results/conclusions-and-recommendations/pro-pig/) suggested that combining indoor housing and pasture systems might be a way forward supporting animal welfare and reducing the well-recognised high risk of ammonia emissions from concrete outdoor runs.

The **overall aim** of the report was to support a wider adoption of combined indoor and pasture systems in organic pig production across Europe to improve the credibility of organic pig production while improving animal welfare and reducing nutrient losses.

The **specific objectives** are to identify:

a) Positive and negative aspects of pasture and indoor systems, respectively.
b) Best practise examples and new innovative ideas through stakeholder inputs from Switzerland, Austria, Netherlands, Germany, France, Italy, Sweden and Denmark.
c) Key challenges and knowledge gaps for future research and development themes.

3 Participants and method

In total, 120 people with a professional knowledge about organic pig production participated in workshops or interviews providing the information summarised in this report. The distribution of participants is listed below in table 1 divided in profession and nationality.

Table 1: Overview of participants

Country	Farmers[(1)]	Advisors
Austria (A)	10	8[(2)]
Denmark (DK)	9	2
France (F)	2	6[(3)]
Germany (D)	4	17
Italy (I)	13	5
Netherlands (NL)	8	8[(4)]
Sweden (S)	7	2
Switzerland (CH)	27	0
Total	80	40

[(1)] Including farm managers
[(2)] Including 2 experts and 3 scientists
[(3)] Including 3 scientists
[(4)] Including veterinarians

The report is based on inputs from organic pig farmers and professional advisors within pig production across Europe as part of the Core Organic Cofund project, POWER. The information gathered are either provided on workshops or by individual interviews with farmers and advisors within each of the participating countries. The procedure for interviews and workshops were based on a common protocol developed in the POWER project (see appendix: National stakeholder workshops in POWER WP3). The information level varies between countries, therefore not all sections in the report include data from all countries. Throughout the report, statements from participants from each respective country is referred to by the name or letter abbreviation.

4 Positive (+) and negative (÷) aspects of rearing pigs on pasture or indoor with outdoor run

Across countries, some farmers practice a production with some groups of pigs on pasture, but only in Denmark, it is common practice to keep both lactating and gestating sows on pasture all year. Most organic pigs from the participating countries are kept indoor with an outdoor run. The outdoor runs differ in roofing (according to common practice and national rules) and flooring with various floor types as either slatted, solid or a combination of the two (according to national rules). Every country report that the outdoor run is mainly used for excretory behaviour. In some countries, they have success with having a specific toilet area. Eliminating outdoors keeps the indoor area clean, where the lying area is located. However, some of the interviewed participants agree that the outdoor run is not creating a positive image for the organic production system.

Positive and negative aspects of rearing pigs on pasture or indoor with an outdoor run according to the interviews are listed below by bullet points.

4.1 Pigs in indoor systems with a concrete outdoor run

+ Temperatures are more moderate (D)
+ Same system the whole year (D)
+ Treatments and control of animals is easier compared to pasture (D)
+ Less area is needed (D)
+ Manure is collected and can be applied on fields in a more controlled way (D)
+ Specific for sows in service area: registration of signs of heat, correct storage of semen and insemination is easier to practice (DK)

÷ Less space per animal (D)
÷ Natural behaviour such as rooting is limited/not possible (D)
÷ More expensive to establish a stable (D)
÷ There are difficulties keeping the outdoor run clean from manure. Ammonia emission from the outdoor run is considered a threat (CH, NL)
÷ Poorer work environment due to dust and noise
÷ Specific for sows in service area: more fights between sows as they lack flight opportunities (DK)

4.2 Pigs on pasture

+ More space per animal (D, DK)
+ Fewer fights as there are more flight opportunities, and therefore fewer injuries (DK)
+ Outside climate (D)
+ Animals are in general more robust and healthier (D, DK)
+ Lower infection rate (DK)
+ Natural rhythm and behaviour such as rooting (D, DK)
+ Possible to integrate in crop rotation (D)
+ Looks great to have pigs on grassland – image is important to retain consumers (D, NL, DK)
+ No iron supplementation for the piglets is needed when having access to pasture/soil (F)
+ Improved work environment (DK)

+ Save the money of building a barn (DK)

÷ Require rather large areas (D)
÷ Regrowth of areas are necessary (D)
÷ Environmental risk of hot spot pollution (DK)
÷ Problems with frozen water supply during winter (DK, D)
÷ Clay soil and/or large precipitation are both parameters, which can cause bare soil, wet animals and wet/humid huts (D, DK)
÷ Lack of shade/sun protection (DK)
÷ Control, handling and capturing of animals is more complex, so pigs are often sicker before treatment is started (D, DK)
÷ Stones can injure claws (D)
÷ It is not possible to sanitise in case of epidemic, worm infestation, parasite pressure etc. (D)
÷ Loss of animals due to predators and diseases brought into the system by birds (DK)
÷ Concerns about the future of free-range pig farming, mainly due to the current situation regarding African swine fever (A, NL)
÷ Specific for sows in service area: the sows are harder to handle, the semen harder to keep in the correct temperature, costly in labour hours (DK)
÷ Specific for farrowing sows and small piglets: Low temperatures around farrowing is a problem (D)

5 Identification of key challenges for keeping pigs on pasture

From the data collected by the interviews and workshops, the key challenges of keeping pigs on pasture can be divided in three main categories.

5.1 Environmental challenges

Maintaining a vegetal cover is necessary to minimise nutrient losses to the surrounding environment and ecosystems. Pigs' rooting behaviour quickly turn grassland into bare soil, especially when the soil is soft and accessible e.g. due to heavy rainfall. Large areas are needed together with a structured pasture management.

5.2 Welfare and health issues

It is a challenge to keep huts dry and free from chilly drafts, which will affect the health of the animals. Hot temperatures during summertime can also negatively affect the welfare of the sows, especially around farrowing. Keeping pigs on pasture also comes with some challenges in the daily inspections and handling of the pigs. Large areas make a thorough inspection of all pigs difficult and hard to capture individuals in cases where treatment is needed. In the farrowing huts, it is difficult for the farmer to assist the sow or the newborn piglets.

5.3 Increased labour hours

Not only the inspection and capturing of sick animals increase the labour hours on pasture. Feeding routines, fence maintenance, water provision, relocation of sows throughout the cycle together with weighing and capturing for slaughter are all routines which are more difficult on pasture compared to an indoor system.

6 Highlight of best practises from different countries

Best practice represents a production system and management routines that are widely adopted by farmers in the specific countries as it gives a high level of animal welfare and high production results.

This chapter contains examples of best practise within organic pig production both for pigs in outdoor runs and pigs on pasture. All examples are based on the interviews.

6.1 Pigs in indoor systems with a concrete outdoor run

Floor type and attractiveness of the outdoor run (DK, A, NL)

There are some contradicting approaches both within and between countries, when it comes to floor type and attractiveness of the outdoor run. It is here summarised in few bullet points.

- Participants from Denmark promoted drained floors to ensure less ammonia emission, and an even and smooth surface to reduce the prevalence of leg problems and hock lesions. However, Denmark also addressed the fact that concrete floors can cause pressure injuries on the side of the knees in summer times when pigs spend much time lying on these hard surfaces.
- The participants from Austria expressed a more divided view on slatted floors. Some farmers and experts state that they may not function properly due to low stocking density resulting in higher fouling, and some support partly slatted floors. The participants who were sceptical towards slatted floors promote solid floors, provision of straw, additional enrichment and/or roughage as it makes the outdoor run more attractive.
- Denmark agreed with Austria in terms of enrichment and provision of roughage on the outdoor area to make it more attractive. Additionally, feed dispensers placed on the outdoor area can make the outdoor area more attractive and reduce indoor defecation.
- Participants from Netherlands recommend not to make outdoor run too comfortable for lying and exploration as their experience is that the more often pigs stay on the outdoor run, the higher the risk is that they will dung and urinate indoors. However, they do promote wind protection at the ends of a building or between groups of pens. Here wind break tarps are considered more effective than high solid partitions.

Cooling by sprinklers or shade

- Sprinklers/showers aren't enough for cooling the animals during the summer. It is the experience that shade is more efficient to facilitate the animals' thermoregulation. Providing shade is also beneficial by reducing the risk of sunburn. Combining showers and shade by placing sprinklers in covered areas can be beneficial as it facilitates a better pen hygiene. (DK)
- A cooling facility on hot summer days can prevent heat stress and maintain feed intake and daily gain. A sprinkler (shower) is regarded as more convenient than a wallow. Furthermore, the additional amount of water will buffer NH4+ in the slurry and in theory reduce NH_3 emission. (NL)

Roofing of the outdoor run (A, S, DK)

Roofing gives a drier concrete run, a clean resting area for the pigs, facilitates thermoregulation, reduces the risk of sunburns and gives bedding material used on the outdoor run a longer durability. During the winter it also reduces chilly drafts to the inside area. It is an investment but saves the farmer and the environment for some of the cleaning hours, the risk of surface run off with manure and the handling of large volumes of water from precipitation. Most farmers have 50-75% roofing. The maximum roofing percentage found in

these interviews was a cover of 90% used in Switzerland which is also the maximum allowed according to Austrian legislation. Table 2 shows an overview of regulations for roofing in outdoor areas.

Table 2: Maximum outdoor area covered by a roof according to regulations

Regulation	Country
Open-air areas may be **partially covered**.	EU
Maximum **50%** of the outdoor area.	CH and DK[(1)]
Maximum **75%** of the outdoor area.	NL and S
Maximum **90%** of the outdoor area.	A
Maximum outdoor area **covered** by a roof is regulated by the Federal States according to production phases and varies between **50%** and **90%** (mostly **75%**).	D
Minimum space requirements for **open** (not covered) outdoor area: **0.23** m²/pig for growing pigs (25-60 kg) and **0.33** m²/pig for finishing pigs (60-110 kg). [(2)]	CH

[(1)] In DK it is required that pigs should have the opportunity to seek **shade** in the **outdoor** area.
[(2)] This regulation is voluntary.

Automatic sorting weight or extended eating areas (S, DK)

An automatic weight combined with ad libitum feeding system makes it possible to sort pigs based on weight to different feed types varying in energy content. The system also alerts if a pig has a reduced growth rate, which can be an indicator of illness or other problems and the farmer can react on this alert. This feeding system also gives a higher welfare in terms of less fighting during eating. It is a costly investment, but it does optimise feeding, lower feed losses and eliminate the workload for manual weighing of pigs. In farms with smaller group sizes, the investment can be made more profitable by expanding pens. This optimise the utilisation of the capacity, which can be 250-400 animals/weight. However, bigger group size can increase the risk of spreading infectious diseases and reduce the welfare in terms of social environment for the pigs.

It is also possible to optimise pig health, welfare and growth rate with a smaller investment by only extending the eating area to allow more pigs to have access and less fighting and stress will occur during eating.

Cleaning (S, F, A)

Cleaning both pens and equipment before insertion of a new group of pigs to an emptied pen is an effective way to stop infections across groups of animals. There is a workload in cleaning the pens, but during the production, it gives less work with and worries about sick animals. The outdoor areas are cleaned at least once a week, which can cost both working hours and fuel, but gives the animals a clean resting area and less ammonia emission. It is very useful to make the pens easily accessible for cleaning both indoor and outdoor for example by larger gateways with accessibility for mechanical cleaning and by flexible drinkers that can be moved during cleaning.

Roughage (S, F, DK, A)

Some farms provide silage bales once a week either indoor in the deep straw or on the outdoor run. This provision increases pig welfare as it gives an opportunity for performing more natural behaviour and lower the risk of stomach ulcers. It is, however, costly both in more manual cleaning and feed losses as the bales are placed on the floor and therefore become soiled easily. The feed losses are also a negative environmental effect as it lowers the feed utilisation. Other farms provide silage in a rack, which requires more work hours in terms of provision of silage, but it gives the pigs a constant access. Feed loss from a rack can be reduced by combining the rack with a trough underneath keeping wasted roughage clean and feasible for eating. It is

essential to place racks easily accessible, as it will help to insure frequent provision. Another option could be to invest in automatisation, which will minimise labour hours.

Enrichment and rooting material (S, A)

Enrichment and rooting material are important to stimulate natural behaviours. One farm in Sweden provides chopped wood chips on the soil adjacent to the concrete area. It is costly in work hours and purchase of wood chips, but it gives healthier pigs and stimulate natural behaviour. The used material is replaced, stored and spread on arable land.

Chilly drafts (DK)

It is important for the pig's health to avoid chilly drafts in the resting area of the pen. Walls, big bales, tarp curtains and plastic lamellas can help provide the shelter needed.

6.2 Pigs on pasture

Cooling by wallow or shade (F, DK)

With a wallow, the sow will avoid hyperthermia and its consequences such as reduced appetite and milk production. Make it possible for the sow to dig a wallow for cooling by watering the pasture in one fixed area or make an artificial wallow. Another way to avoid hyperthermia is to provide shade. This can be done by use of trees. Trees will also be environmental beneficial as they reduce nutrient leaches. It is important to plant trees in a way, so they do not constitute an obstacle when the area is used for cereals during crop rotation.

Parasite control (S)

Pasture rotation interval at a minimum of 3 years is recommended to control roundworms infections. Fewer infections give higher animal welfare and growth. Furthermore, the rotation also insures a more even distribution of manure.

Protective fencing (F)

Fences that surround the whole area including the feeding storage will protect the animals from potential contaminations by wild species such as wild boars and protect piglets from predation. A large fence will be costly in materials and labour hours, both as an investment and in maintenance. However, it will save money and labour by avoiding disease and increase piglet survival.

Regrow of vegetal cover (F)

Both animals and the environment will benefit from a better vegetal cover. Having more paddocks than the number needed for the animals at the farm makes it possible to take the once in worst condition out of the production. Slightly more labour and costs is required to maintain the extra paddocks.

6.3 Best practise - regardless of system

Iron supplementation (A, D, F, DK)

There are differences in practice between countries. Iron supplementation is in general used in Austria and Germany, where supplementation is mainly done by injection within the first three days of the piglets' lives. Few farmers inject twice, once within the first days and once around two weeks of age. Supplementation with iron may be beneficial for the piglets' health. Iron injections are also common practise in France for sows and piglets kept indoor, whereas it is not practiced when sows are kept outdoors as the animals is expected to have their iron requirement fulfilled from the soil. In Denmark, all organic piglets are raised on pasture until at least 7 weeks of age, but two of the six farmers with outdoor sows still use iron supplementation.

In general

Regardless of production system it is important to focus at the function of the whole area – not only the outdoor run, the hut or other individual parts of the animals' area. Focus should at all times be on the welfare of the pigs – not only on regulations regarding the production system. (DK)

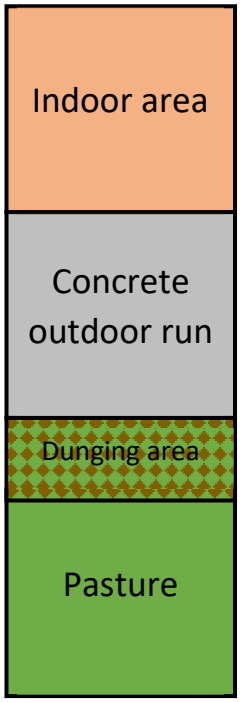
7 Highlight of innovative ideas from the participants

Innovative ideas are defined as new ways of doing things that are different from the common best practise systems and routines. It is important to note that in some cases innovative ideas proposed by one country might already be applied/considered best practise in other countries due to differences in legislation and/or production systems.

7.1 Pigs in indoor systems with a concrete outdoor run

Attractiveness of the outdoor area – enrichment and pasture access

- Well working rooting areas/boxes to stimulate natural behaviour. (CH)
- Proposed rooting materials are sand, round stones and wood chips. (I)
- Provide bedding material in the outdoor run. (CH)
- Indoor system with access to an area planted with willow or poplar threes adjacent to the outdoor area – this also provide shade. (DK)
- Combining indoor pens with access to pasture (CH, A). Only one farmer reported experience with pasture access in relation to indoor housing of growing-finishing pigs (A); he used to provide permanent pasture access (no rotation) for the pigs in addition to housing and concrete outdoor run. However, he abandoned this practice because parts of the pasture were highly affected by high nutrient loads and thereby rick of leaching. Pigs used the pasture area adjacent to the concrete outdoor run for dunging. First, he tried to mitigate fouling and nutrient leaching in this area of the pasture through the application of litter material (straw). However, this was intensive in terms of costs and work and therefore not an appropriate solution for the farm.
  There are few other free-range systems combined with housing in Austria, and some very small farms may provide additional pasture access too. The main obstacles mentioned were unsuitable soil and climate conditions in Austria as well as unsuitable structure of farms/farmland. (A)



Attractiveness of the outdoor area – weather protection

- Wallow or bathtubs for cooling. (CH, F)
- Sprinklers/irrigation/shower. (CH, A)
- Plants adjacent to the outdoor run can provide shade. (CH, F)
- Lying walls in the outdoor can provide better lying, escape and thermoregulation opportunities. It will also facilitate better hygiene and reduce the risk of sunburns. (DK)

Cleaning of the pen

- Mechanical cleaning is proposed by more countries and an automatic manure scraper is under development/testing in Austria. It is an expensive investment, but it will decrease manual labour and ammonia emission. (CH, A)
- Stronger slope of outdoor area leading away from the building. Drainage will be collected by an open pipe leading to the manure storage. (S, CH)
- Create a preferred lying area in the indoor pen with a tarpaulin as close roofing. Hopefully, this will give less work hours and costs in terms of cleaning and bedding material. (S)

Feeding

- Individual eating places for pregnant sows will reduce risk of fighting, stress, lesions, infections and surplus feeding.
- Provision of silage in feed racks instead of on the floor. This method is already used at some farms, but it can be optimised/developed to minimise feed loss e.g. by more narrow grids or throughs underneath. (S, DK)

Roofing

- An automatic cover that adapt to the current weather conditions will make it possible to protect the pigs from both heavy rain and sunburns. It will also keep provided bedding/rooting material dry and reduce the risk of runoff water to the surrounding environment. (F)
- Increase percentage of roofing. Makes it possible to use bedding material outside and avoid rainwater to fill up the slurry storage. (I, DK - DK legislation have a maximum of 50% cover)

Sows in an indoor farrowing system

- Intermittent suckling. During the suckling period, piglets are separated from the sow for about 12 hours a day for 5-7 days. The sow comes into heat and insemination can take place. Meanwhile, piglets continue suckling. In this way, piglets profit from extended lactation without compromising farm economy through prolonged farrowing intervals. (A)
- A piglet nest along the long side of the farrowing pen gives a short distance for the piglets. (D)
- Additional heating in concreted wall between two piglet nests. (D)
- Small opening in the wall between indoor and outdoor run for the piglets (additional to the door for the sow). (D)
- Boards on every wall in the pen to increase the safety for the piglets when the sow lies down (D)
- Fan to blow cold air under the sow if she is standing → piglets do not stay in this area in the risky time. (D)
- Light in the piglet nest for orientation of the sow. (D)
- Weaning by removing of the sow, piglets stay in the (farrowing) pen a few days longer. (D)

Other innovative ideas for outdoor run

- Larger outdoor areas (I: more than 1.2 m^2/160 kg). (CH)
- Separating slurry into urine and faces is an expensive system to establish but it will reduce ammonia emission. (DK)
- Weight sorting systems that can handle more than one pen. To keep group size low with the benefits of optimized feeding and automatic weighing of animals. (DK)
- Animal observation with cameras. (D)

7.2 Pigs on pasture

Insulated huts (CH)

Insulation of huts will increase animal welfare both during warm summer days and in the cold winter. Especially the farrowing system will benefit from insulation, as the small piglets are more vulnerable in terms of hypothermia. Insulted huts will be more expensive compared to standard huts.

Larger huts (DK)

If the huts are larger and can have more animals, there will be less huts to move and therefore fewer labour hours. It is proposed to have the feed in the hut, but still supply water outside. Water need to be moved regularly in order to get a more even distribution of nutrients to the soil.

Feeding (F, DK)

Cover on feed troughs limits feed loss as birds are kept away. This will also eliminate potential contaminations brought to the feed by birds. Individual locked feeding stalls for sows on pasture will eliminate competition for feed and make it easier to inspect the animals. Furthermore, feeding sows and piglets together will stimulate feed uptake for the piglets as it is natural behaviour for pigs to eat within the same time and area.

On field sorting weight (DK)

Automatic weight sorting of pigs on pasture to decrease labour hours and optimise the payment for slaughtered animals.

Shade (CH, F, DK)

A tarp or other roofing on the pasture can provide shade. In addition, robust plants can provide shade and shelter for the animals. It can be either few (rows of) trees within the grassland paddock or a paddock within the woods. Trees also enrich the animal environment and absorb nutrients.

Integration of pigs into crop rotation (CH, F, DK)

Integrating pigs in the crop rotation can help interrupt parasite pressure and thereby increase the health and welfare of the animals and decrease costs of treatments. Some labour hours are used on fencing and moving huts during the rotation. For more continuous rotation of paddocks, a mobile system can be used.

Saucaravan – a mobile system in Switzerland
Photo: Caesar Bürgi

Purplefarm – a mobile system in Denmark
Photo: Hans Henrik Thomsen

8 Identification of knowledge gaps, future research and development

The interviews and workshops reveal by far most innovative ideas concerning the indoor systems with outdoor runs compared to pasture systems. However, it will properly be a huge misinterpretation to conclude that this is an expression of less need for research within the pasture system. It is more likely a result of the less common use of pasture systems, and therefore less knowledge and ideas within this system. In this chapter, we identify some of the knowledge gaps and need for future research and development within both the indoor system and the pasture system, based on the output of the stakeholder interviews and workshops.

8.1 Pigs in indoor systems with a concrete outdoor run

Rooting areas in the outdoor run

It is a shared opinion among participating countries, that providing a rooting area will increase animal welfare. More research and experience with rooting areas is needed to provide knowledge about the effects on pig welfare and health. Additionally, ideal rooting materials, size, localisation and structure of the rooting area needs further research.

Roofing of the outdoor run

The national rules for roofing percentages differs between countries. This could express either inconsistence in or lack of research within the area. The automatic weather adaptive cover proposed in the innovative ideas could be a candidate for further research in this area.

Cleaning of pens

Cleaning of pens, especially the outdoor areas are time consuming, and it is a common wish from farmers to automate this work, but a practical applicable method needs to be developed and the effect on ammonia emission needs to be researched.

Flooring (S)

During periods with frosty weather, the concrete outdoor run gets slippery resulting in injuries and pigs avoiding the outdoor area. Therefore, research in strategies to avoid slippery floors are needed. There is also a wish for a comparison of slatted floors of plastic and cast iron. Which materials are better, cast iron or plastic? Especially with focus on pig health and economics. For pig health, cast iron can be less comfortable, but on the other hand plastic tends to get sticky with age. When it comes to economics, cast iron is more expensive but last longer than plastic.

8.2 Pigs on pasture

Capturing pigs

Sorting and capturing pigs on pasture is still labour intensive, and often stressful for the animals. Thus, there is a need to develop new management and/or huts with a capturing system to minimise labour hours and animal stress.

Mobile pig production

Mobile huts either on wheels or otherwise easily moveable makes it possible to have a more continuously movement of pasture areas. This will most likely reduce nutrient hotspots and improve regrowth of plant cover. Mobile systems on pasture in crop rotation is a rather new area with lots of research needed. It needs to be practical applicable without compromising environment, animal welfare or farm finances.

On field sorting weight (DK)

An automatic sorting weight installed in indoor stables in large groups of slaughter pigs is common in Denmark. However, in outdoor systems, weighing pigs is difficult, resulting in economic losses due to lower payment from the slaughterhouse. Having an automatic weighing system on pasture improves having slaughter pigs on pasture but requires a robust system that can withstand all weather conditions.

Shade (CH, F, DK)

Pigs are rather sensitive towards warm and sunny weather, and for pigs on pasture new ways of providing shade besides the huts, need to be developed. Shade can be provided in several ways, but using trees gives other environmental advantages. Agroforestry with pigs needs further research to gain the full potential of integrating trees. In addition, other, for instance movable roofing/covering systems to provide shade would be relevant to develop.

8.3 Regardless of system

Prolonged lactation

Prolonged lactation combined with induction of lactational oestrus can be practiced regardless of system. In an indoor system by moving the sow away from the piglets (as intermittent suckling proposed in innovative ideas mentioned in 7.1) and on pasture by introducing a boar to a group of lactating sows. Both practices make it possible to prolong the lactation period without reducing number of litters per sow per year, but the effects on litter size, piglet weight gain and sow weight loss needs to be further investigated.

9 Conclusion

It is evident that the practice of organic pig production differs a lot across the participating countries. It is important to share knowledge about best practice within and across countries to improve the systems in all countries. Inputs from stakeholder interviews and workshops presented in this report confirm that both farmers and advisors have many innovative ideas that could continuously develop the organic production in the future, just waiting to be supported by practical trials or scientific research.

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National stakeholder workshops in POWER WP3

Goal of workshop:

- Input from **farmers and advisors** as an important first step in identification of good examples and innovative approaches regarding husbandry practices in organic pig production. For
    - outdoor run – WP1,
    - combined indoor and pasture systems – WP3
- Elaborate on innovative ideas, and best practice through group discussion: get details and citations.

Timing of workshops: Sept-Dec. 2018

Workshop layout:

It has to appear if the questions are answered by farmers, advisors or both groups

Farmers:

- 1-3 Group discussions with participation of 5-10 professional pig farmers (and if relevant advisors) for each discussion, alternatively individual farmer interviews, (in total min. 5 farmers or advisors per country).
- Duration of workshop approximately 2 hours.
- Optimally 2 project persons involved – 1 facilitator and 1 taking notes.
- Open questions – qualitative questions. Key words to help structuring the debate. We are confident that open questions will work both in group situations and in individual interviews.

Advisors:

Group discussion and/or individual interviews

- 2-4 advisors/stakeholders involved in organic pig farming
- Advisors may suggest innovative farmers to participate.
- Advisors may participate in farmer workshops if relevant

Recruitment of farmers as participants in the project - with best practice systems and possibilities for innovation (outdoor run – WP1, combined indoor/pasture systems – WP3) may be a beneficial side effect of the workshops, however not a particular goal.

Date of workshop		Number of participants + E.g. names
Interviewer		

Contents of protocol sheet

Notes

Production system sows and lactating sows with piglets (in participants' farms)							**sheet A.1.**
Subject	**Keywords for Inspiration**	**Sows service area**		**Pregnant sows**		**Lactating sows/piglets**	
		Pasture	Indoor	Pasture	Indoor	Pasture	Indoor
Outdoor access	▪ E.g. pasture ▪ E.g. concrete outdoor run						
Group size	▪ Approx. min-max						
Seasonal difference	▪ Yes/no ▪ If yes, give brief description						
Pros -Pasture / Indoor							
Cons -Pasture / Indoor							

Sows and piglets				**sheet A.2.**
Iron supplementation piglets	Is it done and, if yes, on which form.	Yes	No	How is iron supplementation assigned; by injection, orally or…
Innovation:	Innovative ideas concerning farrowing pen, piglet nest or management around farrowing and weaning			

Production system growing pigs (in participants' farms)				**sheet A.3.**
Subject	**Weaners**		**Growers/ finishers**	
	Pasture	Indoor	Pasture	Indoor
Outdoor access -E.g. pasture -E.g. concrete outdoor run				
Group size -Approx. min-max				
Seasonal difference in production system -Yes/no -If yes, give brief description of the difference				
Pros -Pasture / Indoor				
Cons -Pasture / Indoor				

<table>
<tr><th colspan="3">Systems with concrete outdoor run - weaners and growers sheet B.1.</th></tr>
<tr><td><u>Subject</u></td><td><u>Keywords to Inspiration</u></td><td>Weaners</td></tr>
<tr><td rowspan="2">What is working well, in your opinion/from your experience/on your farm?
- and why</td><td rowspan="2">– Flooring, roof, litter, wall structuring
– Manure management, hygiene and cleanliness, defecation
– Feeding/drinking, roughage
– Animal health, animal behaviour (e.g. rooting, enrichment), thermoregulation (shower?)</td><td>Growers</td></tr>
<tr><td rowspan="2">Weaners</td></tr>
<tr><td>What is the greatest challenge from your point of view?
- and why</td><td>– Seasonal changes
– Behavioral problems, fx. hygiene, unwanted behavior
– The age of the animal, fx. More challenge in the beginning or in the end of the production period
– Housing system aspects</td><td>Growers</td></tr>
</table>

Systems with concrete outdoor run – weaners and growers		**sheet B.2.**
Subject	**Keywords to Inspiration**	Weaners
Describe the pros and cons in respect to the economy in this type of production system	– Work hours – Cost of labour – Cost of investments – Cost of technology	Growers
Describe the pros and cons in respect to work quality and work environment in this type of production system	– Overall feeling of satisfaction – Work load (Pain in body parts due to work) – Work conditions (dust, noise, temperature etc.) – Risk of accidents (Experience of accidents?)	Weaners
		Growers
Describe the pros and cons in respect to environmental/climate impact in this type of production system	– Nutrient leaching and losses – Greenhouse gas emissions – Building soil fertility/Risk of soil erosion – Use of fossil energy	Weaners
		Growers

<table>
<tr><th colspan="3">Systems with concrete outdoor run - weaners and growers sheet B.3.</th></tr>
<tr><td><u>Innovation</u></td><td><u>Keywords to Inspiration</u></td><td>Weaners</td></tr>
<tr><td rowspan="2">If you should/could change something in the existing system, what will you then change?
- and why?</td><td rowspan="2">– Animal welfare
– Economy
– Working environment and safety
– Nutrient loses and climate impact: outdoor area, feed, manure</td><td>Growers</td></tr>
<tr><td>What would be the benefits of this new system for the farmer?- and for the animals?</td><td>– Animal welfare
– Economy
– Working environment and safety
– Nutrient loses and climate impact: outdoor area, feed, manure</td><td></td></tr>
<tr><td>Which specific measure would <u>you</u> like to test to improve outdoor runs?</td><td colspan="2"></td></tr>
</table>

Combined systems (Pasture + indoor) systems - all animal categories that are kept in combined systems sheet C.1.		
Subject	**Keywords to inspiration**	
Farmer reason for keeping some animals - which animal groups - on pasture -Specify animal category: Sows/weaners/groves	– What is working well? – Restrictions to keep more animals on pasture, any benefits? – Outdoor management routines – Management routines of how you feed and water your animals – pros and cons?	
What is the greatest challenge from your point of view? -Specify If challenged – do you see a solution?	– Seasonal changes – Behavioral problems, fx. hygiene, unwanted behavior – The age of the animal, fx. more challenge in the beginning or in the end of the production period – Management problems - routines of how you feed and water your animals – – Soil, vegetation	

Combined systems (Pasture + indoor) systems - all animal categories that are kept in combined systems sheet C.2.		
Subject	**Keywords to inspiration**	
Describe the pros and cons in respect to the economy in this type of production system? -Specify animal category: Sows/weaners/groves	– Work hours – Cost of labour – Cost of investments – Cost of technology	
Describe the pros and cons in respect to work quality and work environment in this type of production system -Specify animal category: Sows/weaners/groves	– Overall feeling of satisfaction – Work load (Pain in body parts due to work) – Work conditions (dust, noise, temperature etc.) Risk of accidents (Experience of accidents?)	
Describe the pros and cons in respect to environmental/climate impact in this type of production system -Specify animal category: Sows/weaners/groves	– Nutrient leaching and losses – Greenhouse gas emissions – Building soil fertility/Risk of soil erosion – Use of fossil energy	

Combined systems (Pasture + indoor) systems - all animal categories that are kept in combined systems Sheet C.3.		
Innovation	**Keywords to Inspiration**	What would you change
If you should/could change something in the existing system, what will you then change?	– Working environment and safety – Housing, shade, water, trees, rotation, time limit – Mixed-specie	
	– Nutrient losses and climate impact – outdoor system, feed, manure – Animal welfare – Economy	Why would you change it
What would be the benefits of this new system for the farmer?- and for the animals?	– Animal welfare – Economy – Working environment and safety – Nutrient loses and climate impact: outdoor area, feed, manure	
Which specific measure would <u>you</u> like to test to improve the system?		