

Summary of the Austrian Project “Pro-SAU”: Evaluation of Novel Farrowing Systems with Possibility for the Sow to Move

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Outline

In Austria the permanent confinement of sows in farrowing crates resulted in fierce discussions about animal welfare. As a result, the “1.Tierhaltungsverordnung” (Austrian Animal Welfare Act) was revised, stating that as from 2033 sows may only be crated during the “critical phase of life” for piglets. The project “Pro-SAU” was established to evaluate farrowing systems with the possibility of temporary sow crating. Apart from generating scientific determinates for an admissible duration of the crating period aspects of animal health and welfare and economic criteria were considered. After 3.5 years of testing, results of the project “Evaluation of novel farrowing systems with possibility for the sow to move” are currently available. The findings shall serve as a basis decision-making process for the commissioning Austrian Ministries (BMASGK and BMNT). The decisions regard a necessary amendment of the “1. Tierhaltungsverordnung”, pig husbandry in farrowing pens.

Altogether, four confinement periods (CP 6, 4, 3 and 0) were investigated in five different pen types. Data from three research farms and six piglet producing farms was collected and analysed in matters of piglet mortality, behaviour, injuries related to husbandry, soiling and economic aspects.

The results regarding the central objective of evaluating “critical phase of life of suckling piglets” shows that piglet mortality can be reduced considerably by confining the sow for three days after birth (until the fourth day of piglets’ lives) in comparison to the CP 0 without any confinement of the sow. Overall, production performance in three of the new farrowing pens, with possibility for the sow to move, (LK-pens: “Flügel-”, “Knick-” and “Trapezbucht”) is comparable with conventional farrowing pens with permanent confinement of the sow. These results generated in the research farms were also confirmed by the six participating practical piglet producing farms.

Regarding the evaluation of the farrowing systems, it can be concluded the three LK-pen designs are complying with the Austrian Animal Welfare Act; occurring constructional and functional deficits were eliminated throughout the project period. The identified injuries were primarily linked to flooring surfaces.

The advantages of the possibility for the sow to move in farrowing pens were and are indisputable. – Moreover, this gain of mobility is accompanied by tolerable piglet losses regarding animal welfare and financial expenses and are comparable to common piglet production systems with permanent crating of the sow. As a matter of fact, the production results provide certain production reliability for piglet producers in Austria. However, it has to be mentioned due to the bigger pen area and higher work load, the building (+28-30 %) and working costs (+10-11 Euros per sow and year) will increase substantially.

With recent legislation in the farrowing sector, Austria forges ahead creating new animal-friendly ways within the EU. Nevertheless this gain in animal welfare results in substantial economic disadvantages for Austria in the European context. Therefore measures such as adjustments in the Austrian subsidy system must be taken to cushion the existing detriments.

Introduction

Since the 1970s, sows in Europe have been kept in farrowing crates during farrowing and lactation. This form of animal husbandry led to substantial increases in piglet production productivity (decreased man-hours and investment needs; reduced piglet losses to an acceptable level). The aforementioned production advantages are counteracted by negative impact on the health and welfare of sows: the animals are restricted in their movement and are therefore not able to separate faecal matter from the lying area or perform appropriate nest-building and birth behaviour. In addition, contact and communication with the piglets is limited. Crating of sows results in cumulative occurrence of housing related injuries.

Fierce public discourse erupted in Austria regarding proper sow care. On March 9th, 2012 the "1.Tierhaltungsverordnung" (Austrian Animal Welfare Act) was revised (BGBl. II Nr. 61/2012). The new legislation stated sows from January 1st, 2033 may only be crated during the "critical phase of life" of piglets. They may only be kept in farrowing pens at least 5.5 m² and a minimum width of 160 cm. Furthermore, the crates must be adjustable in length and width to the sow's individual body size.

The amended requirements for keeping sows in farrowing pens did lead to numerous questions regarding pen design, animal welfare, economic efficiency and occupational safety. These were addressed and investigated in the course of the project "Pro-SAU", that was commissioned by the Bundesministerium für Arbeit, Soziales, Gesundheit und Konsumentenschutz (BMASGK, former Federal Ministry for Health and Women) and the Bundesministerium für Nachhaltigkeit und Tourismus (BMNT, former Federal Ministry of Agriculture, Forestry, Environment and Water Management) in autumn 2013. The project partners (Chambers of Agriculture, Agricultural Research and Education Centre Raumberg-Gumpenstein, University of Veterinary Medicine Vienna, University of Natural Resources and Life Sciences, Austrian Agency for Health and Food Safety Graz, AREC Francisco Josephinum Wieselburg, VÖS) agreed upon the overall structuring of the project into the following three parts:

- AREC Raumberg-Gumpenstein (subproject AREC) under the supervision of DI Birgit Heidinger
- Chamber of Agriculture Austria with the aim of „Further development of existing farrowing pens – practical part“ (subproject LK) under the supervision of DI Johann Stinglmayr
- University of Veterinary Medicine Vienna (subproject Vetmeduni) under the supervision of Ass.-Prof. Dr.med.vet. Johannes Baumgartner

For the experimental examinations three "research farms" (LFS Hatzendorf, Pig Centre Gießhübl GmbH and pig farm Medau of the University of Veterinary Medicine Vienna) served as test facilities. In the LK-subproject, six piglet production farms ("practical farms") in Lower Austria, Upper Austria and Styria (two farms in each federal state) participated in the project to investigate new farrowing pens in application-oriented circumstances. The involvement of the six piglet production farms was

particularly important for testing newly developed pen systems under practical conditions. Furthermore it was specifically relevant to gather the six farmer's experiences to back up results from the three research farms.

Project Aims and Areas of Research

The aim of Pro-SAU was the detailed scientific evaluation of farrowing systems with temporary crating of the sow. Apart from legal conformity, aspects of animal welfare and management as well as work efficiency and economic variables were included. The central objective of the project was the investigation of the critical phase of life of suckling piglets mentioned in the Austrian Animal Welfare Act. This involves the period after birth during which the piglets are exposed to greater risk of crushing by the sow. Confinement of the sow should therefore serve as a protective measure. The following topics of research were covered:

- Production data and "critical phase of life of suckling piglets" (effect of pen type and confinement period on piglet mortality)
- Animal behaviour (nest-building, birth, activity)
- Skin lesions and injuries of sows and piglets
- Analysis of crushing incidents (video analysis)
- Investigation into primary causes of death (necropsy of dead piglets)
- Animal and pen soiling
- Stable climate

Evaluated Farrowing Pen Types with Possibility of Temporary Crating

During three years of trials, five different farrowing pens were tested. At the beginning of the project in 2013 no appropriate farrowing systems with temporary confinement were available on the Austrian or international market. Extensive development within the LK-subproject put forth seven prototypes of new farrowing systems. After a preliminary examination, three of these pens types ("LK-pens") were chosen for the main experiment: the "Flügelbucht", "Knickbucht", and "Trapezbucht" (see figures 1-3). In addition, two foreign pen types (SWAP-pen from Denmark and Pro Dromi-pen from Holland; see figures 4-5) readily available on the European market were investigated. Those two pen types also provided the possibility of temporary crating but are essentially designed for free farrowing – meaning fixation of the sow is mainly envisaged in exceptional cases. The SWAP-pen and Pro Dromi-pen have a size of 6.0 and 7.4 m² respectively, which is considerably bigger than the required minimum standard.

The five different pens are described as follows:

Flügelbucht (5.5 m²):

- Easy and fast handling when opening or closing the crate (crate can be opened "wing-like")
- Good protection for personnel
- Variety of crate opening capabilities
- When opening the crate, the sides can be telescoped to obtain a maximum range of motion for the sow



Figure 1: Flügelbucht (© Pro-SAU)

Knickbucht (5.5 m²):

- Only one side of the crate has to be opened (back crate door is folded in direction of the piglet creep area)
- Piglet creep area is located along the service aisle
- Pivot points of the crate sides are placed far in the front – resulting in only a minimal “dead sector” in the front area of the pen unusable for the sows
- Crate sides can be telescoped

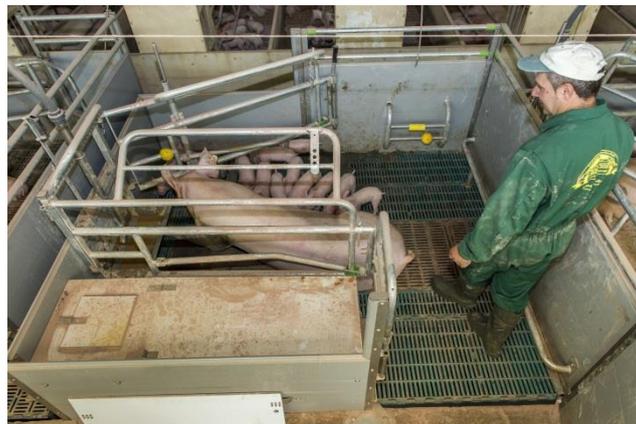


Figure 2: Knickbucht (© Pro-SAU)

Trapezbucht (5.5 m²):

- Crate can be opened and closed by means of a lever on the top of the crate without having to enter the pen (opening state resembles a “trapezoid”)
- Good protection for personnel
- Excellent spatial conditions
- Divided pen door (wall height adjustable)



Figure 3: Trapezbucht (© Pro-SAU)

SWAP-pen (6.0 m²):

- 3.5 m² solid concrete sloped floor
- Crate construction reduced to a single crate side and a sloped wall
- Piglets can be confined in the creep area
- Designed for free farrowing – confinement of the sow mainly in exceptional cases

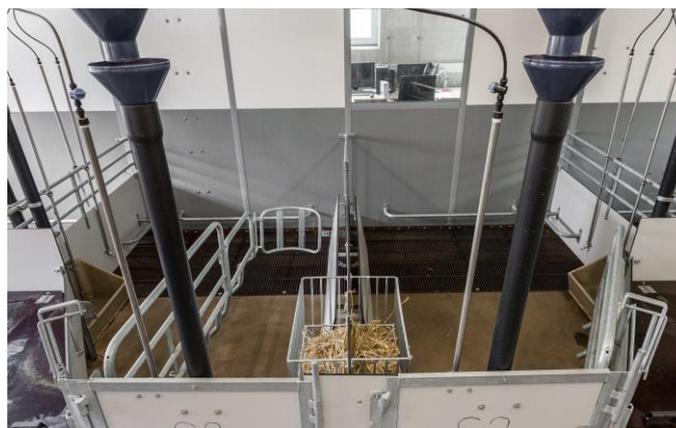


Figure 4: SWAP-pen (left crate closed, right crate open; © Pro-SAU)

Pro Dromi-pen (7.4 m²):

- Combined flooring with cast iron slats, triangle cast iron and plastic
- When the sow is free the crate construction functions as delimitation to the outside
- Piglet creep area can be closed and provides possibilities for additional piglet feeding
- Designed for free farrowing – confinement of the sow mainly in exceptional cases



Figure 5: Pro Dromi-pen (left: crate open, right crate closed; © Pro-SAU)

The five pen types were allocated to three of the research farms with a total of 38 pens available for the experiment. In Gießhübl GmbH and LFS Hatzendorf all three LK-pen types were installed (four and two pens respectively). In Medau, Knickbucht was not installed, but the Pro Dromi-pen was tested instead. The SWAP-pen was present in Gießhübl and Medau (four pens each). In the six practical piglet producing units the farmers chose their favourite pen type out of the three LK-Pens available. The six farms had 8 to 33 pens each – with a total of 146 pens installed under practical conditions. In the six piglet production farms, performance data of 1319 litters could be used for further statistical analysis regarding production output and economic output.

Experimental Design and Methods for Determination of the “Critical Phase of Life of Suckling Piglets”

The investigation of the critical phase of life of suckling piglets was carried out during the main experiment on the three research farms; a consistent experimental design was implemented. One vital criterion of investigation was the occurrences of piglet mortality in the five new pen types while applying four different confinement periods (CP). A comparative analysis regarding animal-based parameters such as behaviour and clinical indicators was carried out. In addition, impacts on workload and economic output were investigated.

It is known from literature that a phase of increased piglet losses generally occurs somewhere within the first week of piglets’ lives (e.g. ANDERSEN et al. 2005; MARCHANT et al. 2000, MOUSTSEN et al. 2013). Therefore, the definitions of the confinement periods were adjusted according to this estimated period of time: In CP 3, sows were crated from the end of birth to day 4 of life. In CP 4, they were confined from the day before calculated farrowing date till day 4 of life. In CP 6 sows were confined from the day before calculated farrowing date till day 6. (This confinement period was also applied in all six practical farms.) In CP 0, which was treated as the reference, sows were not confined at all.

Production data was recorded manually on sow specific cards in the stable and afterwards transferred to the online program “Sauenplaner” (Intelicon Co.). In three research farms 74 farrowing batches were surveyed and data involving 881 litters was recorded. Out of these, 750 litters complied with the previously defined experimental criteria and could be used for further statistical analysis.

All piglets found dead in the farrowing pens (2967 corpses out of 881 litters) were dissected in order to differentiate crushed piglets from those having died from other causes, i.e. diarrhoea or infections. This was needed to clarify which period around and

after birth is most critical for piglets in regards to being crushed and therefore confinement of the sow may represent a reasonable measure to protect the offspring.

Further information from skin lesions and injuries of sows (n=706) and litters (n=677) was recorded in uniform scheme. Injuries were assessed on different time points and differentiated by degree of severity and localisation. The effect of CP and pen type was analysed in a mixed generalized linear model.

Results

Critical Phase of Piglets' Lives and Confinement Period of the Sows

In all five pen types the highest piglet mortality rates were obtained when the sow was not confined at all (free farrowing, CP 0). Confinement of the sow until the fourth day of piglets' lives (according to CP 3 and 4) displays an effective measure to reduce piglet losses. Confinement of the sow for more than four days (CP 6), based on current data, does not offer further advantages. In average of all pen types expected likelihood and differences in piglet mortality range from 11 % in CP 4 to 17.5 % in CP 0 (model results for an average litter with 13 piglets, sow in third lactation and no Oxytocin given). In the pen systems tested and within all confinement periods, increasing litter size and parity number (age of the sow) lead to significantly higher piglet mortality.

Crating the sow after the end of birth (CP 3) results in a significantly lower piglet mortality rate compared to confinement period 0. Piglet losses in confinement period 3 tend to be higher than in CP 4. Moreover, CP 3 requires particular attention and engagement of the stable personnel cumulating in higher workload. The results from behavioural observations indicate higher occurrences of dangerous sow posture changes in CP 3 in comparison to all other confinement periods.

Significant effects of the pen type on the piglet mortality rate could only be observed when focusing on piglet losses during the first week of life. In this period of time the Flügelbucht and the Knickbucht demonstrate better outcomes.

When comparing production results of the three research farms with the six practical piglet production farms no differences can be determined. The results show 12.4 % liveborn piglet mortality in the LK-pens (mean) when applying CP 6 in the three research farms and 12.6 % in the six practical farms (also in CP 6 and on average of the LK-pens). In all nine farms 11.4 piglets per litter were weaned. Consequently, the findings under research conditions were confirmed in practice as well. These findings are subsequently comparable to current production results in pen types with permanent crating in Austria – with the 25 % best piglet production farms showing 11.9 % liveborn piglet mortality and 11.5 weaned piglets per litter.

Animal Welfare

Generally, confinement of the sow leads to restriction of behavioural expression in quality and quantity. It results in a significant reduction of activity of the sows before and after farrowing. During the phase of nest-building, sows confined in farrowing crates show more posture changes. Duration of nest-building is longer demonstrated by non-crated sows and is characterised by higher activity when compared with confined animals. In addition, non-confined sows are more active during farrowing and change lying postures more often. Confinement of the sow does not have an effect on the duration of birth.

On the day after farrowing, the activity of the sows is low with and without confinement and increases considerably thereafter. Crated sows show increased activity on the respective day of release. The confinement period does not have an effect on animal or pen soiling. With regard to animal based parameters assessed in sows and piglets, no clear effect can be found, as damages and injuries of sows and piglets vary from pen to pen. Those are often closely linked to the flooring surfaces chosen and to the design of the respective farrowing crate. Some causes of injuries could be eliminated within the project by adaptation of the pens.

Evaluation of the Five Farrowing Systems

Regarding the evaluation of different systems, it can be concluded that the three LK-pens (Flügelbucht, Knickbucht and Trapezbucht) which were developed within the project are constructed compliant with the Austrian Animal Welfare Act. In principle, this applies also for the foreign pen types SWAP and Pro Dromi, however these pen types show deficiencies concerning flooring slickness, adjustability of the farrowing crates, work management and occupational safety. In terms of animal welfare (risk of injuries, danger of crushing) and work management, special emphasis should be placed on adequate stability and adjustability of the farrowing crate as well as on easily operable mechanisms for opening and closing. In all pen types tested the possibility of free movement of the sow is provided. Within a given minimum pen size of 5.5 m² the length to width ratio defined for each LK-pen, in regards to functionality, is of crucial relevance.

Compliance with Animal Protection

The results of the project formed the basis for the mandatory examination of the new farrowing systems by the "Fachstelle für tiergerechte Tierhaltung und Tierschutz" (Specialist Unit for Animal-Friendly Husbandry and Animal Welfare) which was implemented by law in 2012. In Austria, only pen types (and modifications of those or other new animal husbandry and stable systems) that have been awarded the "Animal Welfare Label" can be offered on the Austrian market. Evaluations by the specialist unit determined that the three LK-pen designs are compliant within the law and were awarded the "Animal Welfare Label" at the request of the husbandry construction companies. The label provides legal certainty and hence should be considered in the process of a farmer's purchase decision.

Economic Efficiency

Model calculations on the basis of a piglet production farm with 140 sows and 40 new farrowing systems were done to assess the different factors influencing economic and work management. Results are based on an analysis of differential costs between new systems and available data from the best 25 percent of piglet production farms in Austria. The following costs were taken into account:

- Building (investment cost)
- Work
- Production data
- Feed costs

In total, (average of confinement periods 4 and 6) the production performance in the LK-pens with 11.6 % liveborn piglet mortality is comparable to conventional farrowing pens with permanent crating of the sow showing 11.9 % piglet mortality. Observed variability between the different LK-pen types is not significant.

Although at the same level of production performance the economic efficiency in piglet production involving farrowing pens with free lactating sows is reduced. Causes are considerably higher investment costs (+28.3 % in the mean for LK-pens with 5.5 m² compared to conventional pens with 4 m²) and additional labor costs (about +€ 10 per sow and year in the mean of the LK-pens).

The calculated additional costs differ considerably between pen type and confinement period and range from € 4.48 (Flügelbucht with CP 4) to € 229.43 (SWAP-pen with CP 0) per sow and year. Based on a farm with 140 sows the confinement periods 4 and 6 on average will lead to total additional costs ranging from € 4,508.33 (LK-pen mean) over € 9,243.18 (SWAP-pen) to € 21,361.27 (Pro Dromi-pen).

Conclusions

From the results of the project Pro-SAU the following conclusions can be drawn:

- Housing of sows in pens with temporary crating limited to the critical phase of piglets' lives implies considerable improvement regarding housing conditions in piglet production and sow's animal welfare without compromising piglets' safety.
- Confinement of the sow for at least three days after birth (until the fourth day of life) represents an effective measure to reduce piglet losses compared to free farrowing. In doing so the confinement of the sow starting a day before calculated birth date improves practicability of the procedure and reduces risk of piglet crushing during birth.
- The conversion of the process to more freedom of movement for sows in Austrian farrowing units will entail considerably higher investment and labour costs – appropriate financial compensation by Austrian governmental agencies is essential!
- The conversion process requires patience and expert advice in terms of sow handling. Moreover, special focus must be placed on pig breeding: Maternal behaviour of the sow as well as vitality of piglets are crucial factors. In this context, breeding strategies only emphasizing litter size are absolutely counterproductive.

Perspective

The project Pro-SAU has been characterised by a unique and constructive cooperation between Austrian science and advisory institutions, the husbandry construction industry and practical farmers. More than 20 institutions were involved in the project. Due to a broadly supported research-oriented project design and the participation of practical farmers valid, robust data was generated. In the near future similar projects shall be planned to evaluate essential questions in respect to the Austrian pig industry and pig housing conditions. For example, pen flooring is an important criterion in terms of pen functionality. In the given project, design questions of flooring material and ideal combination could not be addressed sufficiently. The different demands of sows and piglets regarding flooring conditions (slip resistance on abrasive surfaces for the sow vs. risk of injuries for piglets) as well as thermal conductivity and insulation, durability, stability, cleaning capability, and costs are key factors. Currently diverse workshops function as a platform for professional exchange

between farmers, advisory institutions, the husbandry construction industry, and scientists in order to encourage further development of farrowing pen designs.

In July 2017, the final report of the project Pro-SAU was published and delivered to ordering ministries (HEIDINGER et al. 2017). The findings shall serve as a decision-making basis for the commissioning ministries (BMASGK and BMNT) involving any necessary amendments of the 1. Tierhaltungsverordnung in regard to keeping pigs in farrowing pens. A draft law concerning this matter is expected sometime in 2018. The objective must be to clarify the legal situation and security of investment for piglet producers in Austria as soon as permissible.

For the continuation of economically efficient piglet production in Austria, it was of significant importance to identify practicable system alternatives – in which sows can move freely within predefined time spans – as well as appropriate development opportunities early on, to support the restructuring of the industry until 1st of January 2033 at the latest. A common European solution regarding new farrowing accommodations with possibility for lactating sows to move would be beneficial in terms of competitive equality.

Source

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