RESULTS 2022

NEWS FROM **THE DANISH AGRICULTURE & FOOD COUNCIL PIG RESEARCH CENTRE**

DANISH Boksen:
1000 active users

DanBred breeding goal:
Increase in piglet survival

Danish pig production:
the world's most efficient

Danish Agriculture & Food Council
Pig Research Centre

Welcome to Results **2022**

This year's edition of Results provides insight into the reduction plan for PRRS and how the Danish pig industry can achieve the goals that have been set for the climate area. There is also information about how DanBred's breeding traits will result in better survival rates for piglets and sows and what actions can be taken to solve weaning diarrhoea now that medicinal zinc is no longer an option. Furthermore, more than 50 per cent of Danish pig producers have deployed the DANISH Boksen system – one of them explains how the system has given him more peace of mind. This edition of Results has been compiled by the Danish Agriculture & Food Council and SEGES Innovation.

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Thank you to GUDP and the Pig Levy Fund for supporting a number of projects.

Innovation should live in the housing unit

THE DANISH AGRICULTURE & FOOD COUNCIL AND SEGES INNOVATION HAVE SEPARATED INTO TWO ENTITIES. BUT ALTHOUGH INNOVATION HAS BECOME AN INDEPENDENT UNIT, THIS IS STILL WHERE DANISH PIG PRODUCTION CAN ACQUIRE NEW KNOWLEDGE TO IMPROVE THE BOTTOM LINE AND WELFARE AS WELL AS PREPARE THE INDUSTRY FOR A SUSTAINABLE FUTURE.

2022 has been a year of challenges and new goals for Danish pig production. And most importantly, knowledge and innovation are needed to achieve some of the industry's goals and secure our place among the world's elite in terms of animal welfare, low climate impact, meat quality and efficiency. With the phasing out of zinc and a rise in piglet mortality, we must become even more ambitious in our livestock work. All of it promotes the high standards and meat quality that make our production sought after in the global market.

"In Vision 2050, the goals include more sustainable pig production, progress in animal welfare and better management in housing units. These goals cannot be achieved unless we develop and share the knowledge that SEGES Innovation is constantly examining and researching. Therefore, we are still sharing our results and hoping that Danish pig producers will continuously improve their implementation in the housing units," says Erik Larsen, Chairman of the Danish Agriculture & Food Council Pig Research Centre.

FROM CLIMATE...

In the Agriculture Agreement, which was adopted last year, one goal is frequent discharge of slurry from housing units, which can reduce greenhouse gas emissions by 0.17 million tonnes CO2 of equivalents in 2030. Results from a project with frequent discharge were reported in last year's publication. This year, the focus is on developing new environmental technologies and finding climate measures that can be beneficial on the farm.

"In both years, we have focused on climate projects which have been supported by funds from the Pig Levy Fund. We must be a world leader in reducing climate emissions. The best way is finding inspiration in the knowledge that is being developed for our industry," says Erik Larsen.

... TO ZINC

Many of the initiatives for the zinc phase out were discussed at the ZeroZincSummit, where leading international scientists in the field presented their latest findings. SEGES Innovation contributed with research indicating that vaccines and oral products should make a smooth transition feasible.

"It's important for us on the Sector Board to follow the innovative projects, and to understand how these projects can be manifested in the housing units. These are projects that can help us achieve the goals we have set in our own Vision 2050," says Erik Larsen.

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New measures against weaning diarrhoea

AN ADDITIVE AND TWO VACCINES MAY BE THE ANSWER TO HOW WE STAMP OUT WEANING DIARRHOEA ONCE MEDICINAL ZINC IS NO LONGER AN OPTION FOR PIGLET PRODUCERS. SEGES INNOVATION HAS PARTNERED UNIVERSITIES, STATENS SERUM INSTITUT AND VARIOUS COMPANIES TO DEVELOP EFFECTIVE REMEDIES AGAINST DIARRHOEA IN PIGLETS.

Since medicinal zinc was phased out at Danish pig farms on 26 June 2022, many producers have been looking for new answers as to how to prevent weaning diarrhoea in piglets without increasing antibiotic usage. SEGES Innovation is therefore participating in three projects with various universities, institutions and companies to prevent weaning diarrhoea.

PROTEINS FROM LLAMAS PREVENT INTESTINAL INFECTIONS

A project that is well into the development phase is Ablacto+, which contains nanobodies extracted from antibodies. Nanobodies help to bind the bacteria that trigger diarrhoea. The bound bacteria cannot be attached to the lining of the intestine but are excreted into the faeces, which means that pigs do not produce diarrhoea. It is an additive in the form of a protein that is given to pigs in feed. The protein substance does not in itself have a bacteria-inhibiting effect, as we know from antibiotics, and the bacteria do not form a resistance to the product either.

"Ablacto+ is a new product developed by Bactolife ApS, which is currently being tested at the Grønhøj test station. In the long term, it has the potential to offer an alternative to antibiotics when weaning diarrhoea occurs in piglets. The proteins are extracted from llama blood. The protein can then be copied at a Novozymes laboratory, a partner in the project," says Niels Jørgen Kjeldsen, Chief Adviser, SEGES Innovation.

The current project is supported by GUPD (Green Development and Demonstration Programme) and aims to support the development of Ablacto+ through proof of concept by testing the dosage and allocation period. In addition to Bactolife ApS, Novozymes and SEGES Innovation, Denmark's Technical University and Aarhus University are also part of the partnership. So far, Ablacto+ has been tested at Aarhus University in an infection trial where coli bacteria that cause diarrhoea have been present. The pigs that received Ablacto+ through their feed had a reduced incidence of coli bacteria and increased growth compared to the control group. The project is expected to be concluded by the end of 2022.

VACCINE AGAINST WEANING DIARRHOEA DEVELOPED ALONGSIDE COVID-19 VACCINE

In another project, Copenhagen University, SEGES Innovation and the vaccine company, AdaptVac, are developing a vaccine against weaning diarrhoea. To this end, scientists at the university are using the same technology used to develop the Danish Covid-19 vaccine. The project goes by the name of PIGVAC and has a budget of DKK 14.7 million of which DKK 11 million comprises support from the Innovation Fund.

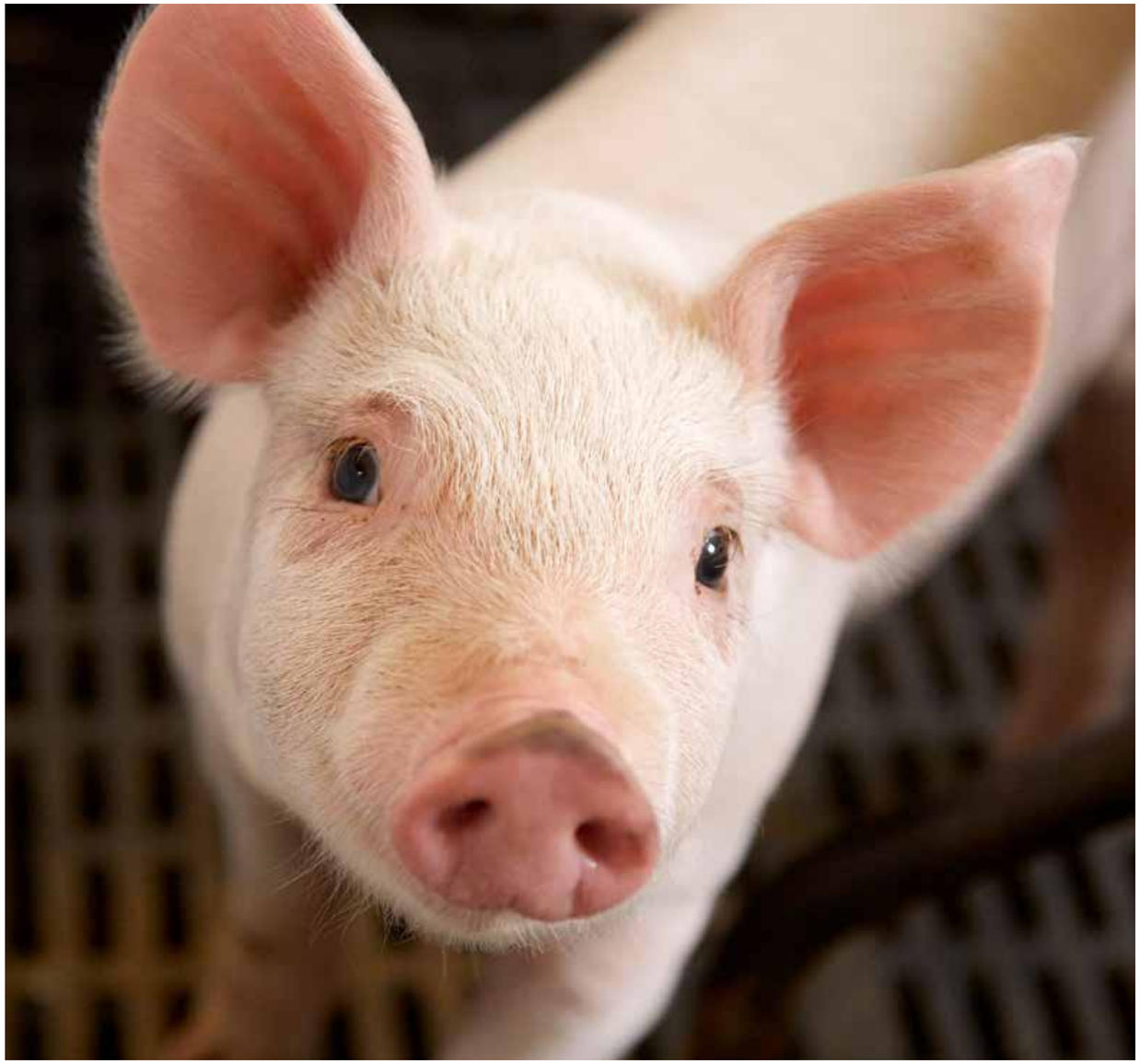
"The technological platform used for the Covid vaccine can be used for other vaccines. The platform has given human vaccines a very long protection period. The scientists develop the vaccines by using virus-like particles to which antigens can be attached, i.e. what you want protection against, on the surface of the particles," explains Poul Bækbo, Senior Adviser, SEGES Innovation.

"When this is injected into a pig, the body perceives it as a virus and begins to form antibodies against what is on the surface, i.e. the spike proteins that we know from the Covid virus."

The vaccine protects the pigs in the long term by strengthening their immune system so that they form antibodies against Lawsonia, Brachyspira and E. coli. The next step in the vaccine development is to test the vaccine in a production herd of sows that will be able to pass the antibodies on to their piglets through their colostrum. The project is expected to be completed in December 2023.

VACCINE TRIAL IN PARTNERSHIP WITH STATENS SERUM INSTITUT

The latest vaccine project, SigAVAC, is a collaboration between Statens Serum Institute, Aarhus University and SEGES Innovation. It is supported by GUDP to the tune of DKK 12 million and means that new-born piglets will be given the vaccine in their first week of life in order to create sufficient antibodies to protect them against the coli bacteria at weaning. The plan is for the vaccine to be tested at Aarhus University, Foulum, next year and then in a production herd. The project is expected to be concluded in June 2024.



MEASURES AGAINST WEANING DIARRHOEA

The additive and the two vaccines against weaning diarrhoea have all been developed to prevent pigs becoming ill and thus increasing the use of antibiotics. They are:

- **Ablacto+** – contains nanobodies which derive from antibodies found in llamas and bind toxin producing E. coli, which are excreted via faeces. The risk of diarrhoea is therefore reduced. The product is consumed orally.
- **PIGVAC** – a vaccine where the same technology used to develop the Covid-19 vaccine results in a vaccine with a long protection period where the pig itself forms antibodies against the diarrhoeal bacteria.
- **SigAVAC** – where the pig is given the vaccine in its first week of life to produce enough antibodies to be protected against the bacteria that causes weaning diarrhoea.

Blood testing provides PRRS overview

EFFORTS TO END PRRS ARE WELL UNDER WAY. CREATING AN OVERVIEW OF THE SPREAD OF THE INFECTION IS THE FIRST STAGE.

The Veterinary Laboratory, Danish Agriculture & Food Council play an important role in mapping the spread of PRRS in Denmark.

Pig producers across the country have accepted the call from the Danish Agriculture & Food Council Pig Research Centre to take and submit blood samples for analysis by the Veterinary Laboratory.

"It's a pleasure to see the high number of blood samples we're receiving. It shows the high level of support for the strategy that has been put in place to reduce the occurrence of PRRS," says Kristian Møller, head of the Veterinary and Quality Affairs department.

Blood samples have been arriving in a steady stream at the laboratory in Kjellerup. But although many pig producers have heeded the call, many others have yet to submit blood samples for analysis.

"In order to make our data overview as detailed as possible, it is important that we get as many people involved as possible. Soon it will become a legal requirement for blood samples to be taken, but we dream of being able to provide a map showing the PRRS status of all pig producers in Denmark - preferably before a legal requirement kicks in," says Kristian Møller.

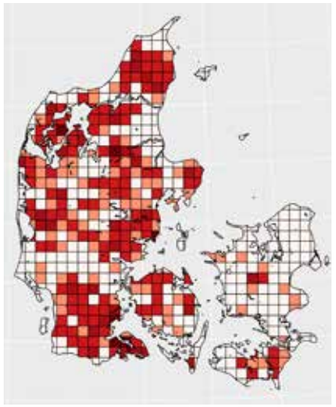
MAP OFFERS OVERVIEW

Results of the analyses will be posted on the national PRRS prevalence map as they become available. Initially, the map may be viewed by veterinarians and DLBR advisers across the country. The aim is to assist pig producers and advisers make the right decisions and take appropriate action in combating the spread of PRRS in their respective areas.

"The map is an excellent tool. It helps pig producers determine the appropriate time to take eradication action and how to tackle it. It opens the way for a dialogue and coordination with other pig producers in the local area so that reinfection with PRRS is avoided post eradication," says Nicolai Weber, Chief Adviser the Danish Agriculture & Food Council and PRRS project manager.

It is no secret that the industry faces a major challenge. To succeed in the battle against PRRS in any area requires openness, trust and honesty from producers, veterinarians and advisers as well as full coordination of the efforts by the Danish Agriculture & Food Council.

"This will succeed only if the entire industry finds common ground, setting aside narrow self-interests for the higher common goal of getting rid of PRRS," says Nicolai Weber.



This map shows herd locations. As declarations become available and posted, the map can be used to see if a specific herd is in an affected area. The national map is expected to be available for everyone at svineproduktion.dk from 1 November.

Globally competitive Danish pig production

DESPITE DIFFICULT CONDITIONS, DANISH PIG PRODUCTION IS PERFORMING WELL – AT LEAST COMPARED TO OTHER MAJOR PIG PRODUCING COUNTRIES.

2022 has not been the best of years in terms of Danish pig producers' earnings. At the beginning of the year, feed prices were high, and the pig price was low: in fact, there have not been many bright spots in between.

African Swine Fever in Germany and Italy as well as declining Chinese imports of Danish pig meat were just some of the factors that made conditions difficult. Moreover, to top it all, at the end of February, Russia invaded Ukraine, which led to rising feed and energy prices

THE EDGE ON THE COMPETITION

Nevertheless, it appears that Danish pig production is performing well when compared with pig production in other competing countries.

"In general, we have an industry that is under tremendous pressure. It hasn't been a lot of fun being a pig producer for a long time. Trading conditions are currently far from being in the pig producer's favour," explains Sisse Villumsen Schlægelberger, Special Adviser, SEGES Innovation.

There are, however, a few bright spots on the horizon.

"Danish pig production has the highest productivity with the most weaned pigs per year sow and the highest daily gain for finishers," she explains.

Compared with the other major European pig producing countries Danish pig production is doing well.

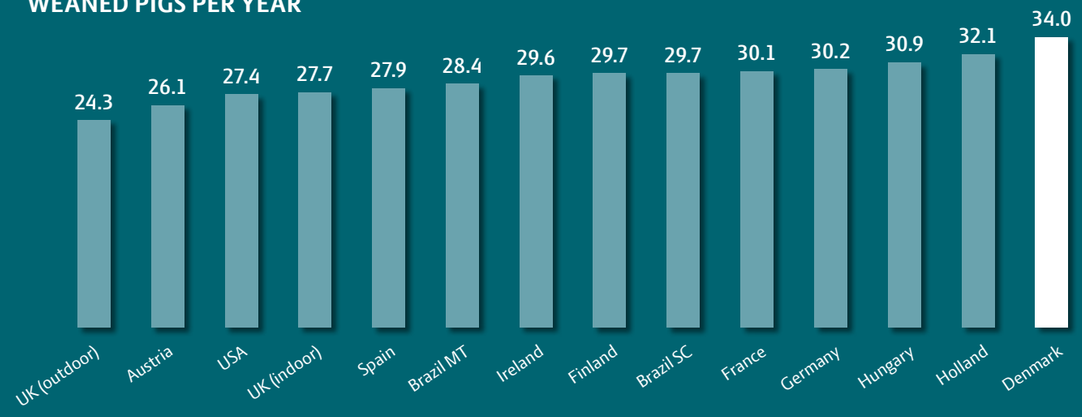
"In the last few years, Denmark has increased its lead over Spain in terms of production costs and has had the lowest production cost in the EU," explains Sisse Villumsen Schlægelberger.

SPANISH PRODUCTIVITY UNDER PRESSURE

Spain is experiencing significant challenges with PRRS, and this is having a negative impact on Spanish pig producers' productivity and their production costs. From Sisse Villumsen Schlægelberger's perspective, there is good reason why Danish pig production has assumed a leading position.

"There are a number of initiatives under way that address the challenges currently facing Danish pig production, ranging from the PRRS reduction plan in Denmark to our work with the new breeding goals. I expect that we'll see more results from these projects in the future – all of which are beneficial to our pig producers' bottom-line results," says Sisse Villumsen Schlægelberger.

DENMARK LEADS THE WAY WHEN IT COMES TO WEANED PIGS PER YEAR



Source: InterPIG 2021.

Breeding goal to increase piglet survival

BREEDING & GENETICS, DANISH AGRICULTURE & FOOD COUNCIL HAS SPENT THE PAST YEAR DEVELOPING A NEW BREEDING GOAL AIMED AT ENSURING A HIGHER SURVIVAL RATE AMONG PIGLETS.

For many years, focus has been on the LG5 trait, which stands for live pigs on day five, i.e. a piglet's survival in the world of genetics. A new approach to improved piglet survival has been found, which means that from now on, it will be divided up into three new traits – a piglet's own genetic potential for survival, the sow's genetic potential for enabling her piglets to survive and litter size, which is the sow's genetic predisposition for reproduction, measured by the number of piglets born.

"The new traits offer greater financial value for the pig producer as the number of piglets is increased through survival. It also benefits welfare in the farrowing unit as the piglets are more robust from birth," says Tage Ostersen, Head of Department, Breeding & Genetics at Danish Agriculture & Food Council.

The change means that the number of weaned pigs per sow is increased. The new breeding goals are expected to result in breeding progress for piglet survival of up to 1 percentage point per year and will have a noticeable effect when this begins to impact pig producers.

SURVIVAL IS WORTH MORE THAN LITTER SIZE

Calculations show that at weaning, an extra pig achieved through increased piglet survival is worth more than an additional pig achieved through increased litter size. Thus, an extra pig obtained through increased litter size has a value of DKK 7.89 per finisher while an extra pig obtained through increased survival has a value of DKK 9.5 per finisher.

"When splitting up LG5 into three new traits, we expect that the balance in the overall breeding goal will lean more towards greater robustness. This will result in significantly more breeding focus on survival and less focus on litter size and production traits," explains Tage Ostersen.

CHOICE OF TRAITS FOR THE BREEDING GOAL

The main purpose of the DanBred breeding programme is to increase the profitability of those Danish pig producers who use genetics. By improving the traits in the breeding goal, the costs of producing a pig are reduced in both the sow and finisher herds. And even if there is greater focus on piglet survival in the breeding goal, the other production traits remain very much in focus.

"Although the new breeding goal deals with piglet survival, Danbred's finisher traits will still remain a focus area in our research, says Tage Ostersen.

A computer simulation programme has been used to find the right way to increase piglet survival, where both the genetic potential of the piglet and the sow is taken into account. The programme simulates the entire breeding system, from the DNA strand to the number of breeding animals in the herds at Bøgildgård and at the AI stations for all three DanBred breeds. The simulation tool is used to gain an insight into how the three new traits will affect the overall breeding progress, but also what can be expected from breeding progress for the individual traits.

The board of the Danish Agriculture & Food Council, Pig Research Centre, which primarily comprises pig producers, sets the breeding goal for each of the three DanBred breeds. The breeding goal comprises the most important pig production traits weighted according to their economic values.

In order for a trait to be included in the breeding goal, the following factors must be met:

> The trait must be important in terms of the economics of production
> The economic value of the trait must be determinable
> The trait must be hereditary and show genetic variation in the three DanBred populations
> The trait must be measurable directly or indirectly on a large scale

RESULT OF NEW BREEDING GOAL:

The Danish Agriculture & Food Council Breeding & Genetics expects that there will be greater focus on piglet survival where the breeding progress will increase by 1 percentage point per year. Over the past four years, feed efficiency has improved by 0.041 FUp/kg daily gain per year. By contrast, less annual breeding progress is expected for litter size, daily gain, meat percent and feed efficiency over the next four years.

Pig producer Preben Bjerregaard has joined forces with his neighbours to implement a PRRS eradication plan.

WHY IS ACTION BEING TAKEN NOW?

> A number of Danish pig farms have been hit by PRRS in recent years. Having seen the consequences that PRRS wreaks on farms, a number of key players have decided on joint action.

WHEN CAN INDIVIDUAL PIG PRODUCERS BEGIN ERADICATION?

> In some areas, it will be crucial that, to the greatest extent possible, neighbouring herds eradicate at the same time so that the infection is eliminated from the entire area and eradication on an individual farm is not in vain. The task itself is extensive and is expected to run over the next three years.

WHAT IS THE AIM OF THE PRRS REDUCTION PLAN?

> For finishers the aim is that 75 per cent of all pigs delivered for slaughter are declared PRRS antibody negative by 2025 and the same applies to 85 per cent of sow herds.

Strategy and collaboration to rid farms of PRRS

BEFORE THE END OF THE YEAR, ALL DANISH PIG PRODUCERS MUST HAVE CHECKED AND REGISTERED THEIR HERDS FOR PRRS. AS HERDS ARE DECLARED, IT WILL BECOME RELEVANT TO TAKE UP CONTACT WITH VETERINARIANS AND NEIGHBOURS ABOUT INITIATING AN ERADICATION PROGRAMME IN A GEOGRAPHICAL AREA. BLOOD TESTS, COLLABORATION WITH VETERINARIANS AND AN OVERVIEW OF THE STATUS OF A HERD ARE THE TOOLS TO BE DEPLOYED FOR ELIMINATING PRRS. THE DANISH ISLAND OF BORNHOLM HAS ALREADY EMBARKED ON AN ERADICATION PROGRAMME.

Over the next three years, discussions about PRRS will probably concern antibody tests, eradication and declaration. A new strategy was launched in May 2022. Initially, the strategy aims to register whether a herd is infected with PRRS.

The Executive Order, which comprises the reduction strategy, is expected to come into force at the start of 2023. It will become a legal requirement that a farm's PRRS status be made known in order that a decision can be made on eradication or PRRS prevention.

"To rid Danish production of PRRS, it is crucial that we know the status of the disease. It spreads locally and is air-borne. This means that we have to work with the local veterinarian to control the disease. To this end, SEGES Innovation has drawn up a map that will gradually be covered as we discover the status of the various herds," says Nicolai Rosager Weber, Veterinarian and Senior Adviser at the Danish Agriculture & Food Council.

In addition to the strategy, PRRS has also changed its status from a list 2 disease to a list 1 disease, which means that the disease is notifiable as soon as it is suspected. Previously, it only had to be reported when the disease was confirmed.

WIDESPREAD INVOLVEMENT IN THE STRATEGY

The reduction strategy has been drawn up by the Danish Agriculture & Food Council, the Danish Agriculture & Food Council Pig Research Centre, The Danish Veterinary Association, The Danish Veterinary and Food Administration, and Danske Svineslagterier. The National Association for Danish Pig Producers has also endorsed the plan.

"The plan to reduce PRRS is supported by the entire industry. The plan itself states that we need to set up regional councils and start looking at some of the highly infected areas which should be coordinated in the best way possible. My clear appeal to all pig producers is to talk to their veterinarian and plan what needs to be done at their own farms," says Nicolai Rosager Weber.

GOOD EXPERIENCE WITH GEOGRAPHICALLY BASED ERADICATION

An example where eradication and local cooperation have come together is in Svaneke on the island of Bornholm. Pig producer Preben Bjerregaard has teamed up with his neighbours as the area has a number of herds that have been confirmed PRRS positive. He and his three neighbours have joined forces in an eradication programme.

"We had to involve our neighbours before embarking on eradication in order to avoid reinfection. We had some very constructive discussions about how we could eliminate PRRS together," he explains.

NEIGHBOURHOOD COOPERATION IS IMPORTANT

Coordinating with his neighbours was crucial for Preben Bjerregaard to eliminate PRRS from his area.

"I had a constructive conversation with my neighbours. As my nearest neighbour had already made up his mind that they should get rid of PRRS, he was all set to join me on this journey," he explains.

Nicolai Rosager Weber has also come across examples where geographically based eradication has gone well.

"There are some local eradication programmes currently underway as the infection may have reached an area where there are neighbouring herds. Experiences from them show that it takes time in terms of meetings and discussions to reach agreement on future action," Weber explains.

"It may be that changes need to be made to the way pigs are traded in the area. Next, a solution needs to be reached if some PRRS positive pigs are found in the area which was thought to be disease-free. It may prove necessary to have access to an empty housing unit outside the zone or area where eradication is being carried out. We therefore have some good experience that we can build on, including in Preben's area."

Reduction of ammonia and odour to increase finisher production

AN AIR CLEANER FROM SKOV HAS BEEN SHOWN TO HAVE BENEFICIAL EFFECTS ON REDUCING AMMONIA AND ODOUR FROM FINISHER UNITS WITH POINT EXTRACTION. FURTHER INVESTIGATION IS ONGOING INTO THE EFFECTS OF HIGHER POINT EXTRACTION AT 15 AND 20 M3/HOUR/PIG. BOTH SYSTEMS ARE EXPECTED TO BE INCLUDED IN THE DANISH ENVIRONMENTAL PROTECTION AGENCY TECHNOLOGY LIST PROMOTING MORE SUSTAINABLE DANISH PIG PRODUCTION.

Environmental technologies are important for Danish pig production to become more sustainable and possibly expand without adversely affecting neighbours. SEGES Innovation investigated whether a SKOV A/S air cleaner can effectively capture ammonia and reduce the concentration of odour from housing units with point extraction. For this purpose, SKOV A/S and INNO+ developed a combined chemical and biological air cleaner with an acid step for ammonia removal and a biological step for odour removal.

In a trial SEGES Innovation tested the effect of the air cleaner processing point extraction air in two finisher herds. The aim was to document the effect, stability and costs associated with the operation of the air cleaner.

The results showed that the air cleaner reduced the ammonia concentration by an average of 95.7 per cent and the odour emission by an average of 76.6 per cent in air discharged through the point extraction.

BETTER ENVIRONMENT AND WORKING CLIMATE

Pig producer Langerod ApS, with finisher production in Heden on Funen, had two air cleaners installed in 2020 in a new unit with 10,000 pens.

"An air cleaner was an environmental requirement for the construction of such a large unit to be approved. We definitely notice the difference the air cleaners make when we go into a new unit. The air inside is great. For my employees, it provides a completely different working environment, an excellent side benefit," says co-owner Henrik Solgaard.

To be able to install the air cleaners and meet the environmental requirements for the expansion, Langerod ApS applied for a subsidy for the new unit. According to SEGES Innovation's calculations, the air cleaner requirement adds an additional cost of DKK 3 per pig.

"The air cleaner has proved to have multiple benefits. In addition to enabling us to expand, our new facility has provided a better working climate for our employees and improved overall environmental performance by our company," Henrik Solgaard says.

POINT EXTRACTION COMBINED WITH AIR CLEANER IS A COMPLETE SOLUTION

When point extraction with a capacity of 10 m3/hour/pig in combination with air cleaning qualified for the Danish Environmental Protection Agency Technology List, the need arose for testing and documenting the removal of ammonia and odour at 15 and 20 m3/hour/pig, as well. If simply increasing the amount of air flow by 5 and 10 m3/hour/pig resulted in greater efficiency, this would provide greater flexibility and options when expanding existing or constructing new housing facilities.

At 15 m3/hour/pig – the number of cubic metres of air extracted by point extraction per hour per pig - 63-67 per cent of the total ammonia emissions and 56-60 per cent of the total odour emissions were removed from the exhaust, according to the test results. A point extraction rate of 20 m3/hour/pig, made it possible to collect 67-79 per cent of the total ammonia emission and 57-78 per cent of the total odour emission.

POINT EXTRACTION MORE COST-EFFECTIVE

"The purpose of the testing was to investigate and document the collection of ammonia and odour in point extraction systems with capacities of 15 and 20 m3/hour/pig. The testing demonstrated that using point extraction is more cost-effective than cleaning all air in a housing unit. Concentrating ammonia and odour in a smaller volume of air reduces the required investment in air cleaning capacity," says Malene Myllerup, Special Adviser at SEGES Innovation.

"However, additional costs for duct installation and a new air cleaner should be taken into account when we increase air volume to 15 or 20 m3/hour/pig. To realise the environmental benefits, point extraction must be combined with an approved air cleaner."

The air cleaner and point extraction for 15 and 20 m3/hour/pig are both expected to make it on to the Danish Environmental Protection Agency Technology List.

> All four companies have good and relevant proposals with a significantly lower carbon footprint value compared to the standard-mixture. We worked with known protein sources such as rapeseed, broad beans and peas, but more alternative protein sources were also used, such as green protein.
>
> *Tina Sødring Bech Petersen,*
> *Special Adviser, SEGES Innovation*

Feed with a lower carbon footprint

THE ANNUAL COMPANY TEST HAS A DIFFERENT FOCUS THIS YEAR - TO TEST THE PRODUCTIVITY OF DIFFERENT COMPANIES' FEED MIXTURES WITH A LOWER CARBON FOOTPRINT.

Agriculture has set itself the goal of being climate neutral before 2050. Through the Climate Act, the Danish Parliament has resolved that a 70 per cent reduction should be achieved before 2030. To achieve this, there is a need for research into all the parameters that impact CO2 emissions from Danish pigs. Around 70 per cent of a pig's carbon footprint stems from feed, which therefore plays a decisive role.

Pig producers who purchase finished feed need to be able to choose feed mixtures with a lower carbon footprint. SEGES Innovation, therefore, invited the feed industry to submit mixtures for finishers with a lower carbon footprint than the average mixture, which usually comprises grain and soybean meal. Four companies - DLG, Danish Agro, BAT Agrar and Hedegaard – submitted their feed proposals for finishers with a lower carbon footprint. The feed mixtures are not yet available in the market, but are the companies' proposed climate-friendly versions.

"All four companies have good and relevant proposals with a significantly lower carbon footprint value compared to the standard mixture. We worked with known protein sources such as rapeseed, broad beans and peas, but more alternative protein sources were also used, such as green protein," explains Tina Sødring Bech Petersen, Special Adviser, SEGES Innovation.

ALL COMPANIES SUPPLIED FEED WITH A LOWER CARBON FOOTPRINT AND REASONABLE PRODUCTIVITY

All four companies achieved a reasonable productivity compared with the control group, which was based on a traditional barley/wheat and soy mixture.

Feed from Hedegaard achieved particularly good productivity with high daily gain and good feed conversion relative to the control group. On the other hand, feed from the other three companies reduced the carbon footprint per FU/finisher by around 50 per cent relative to the control group, which is a bigger reduction compared to feed from Hedegaard.

"When productivity and the carbon footprint of feed are combined into an overall carbon footprint, all companies have a significantly lower footprint per kg daily gain. This is also reflected in the index which goes from 42 to 62 in the table," says Tina Sødring Bech Petersen.

She continues: "As the tested mixtures are unavailable in the market and contain raw materials that can be difficult to price, the same feed price has been calculated for all the mixtures. Any difference in the feed price has therefore not been taken into account."

OUT WITH FAT AND SOYA

There is considerable variation in carbon footprint of the various raw materials in the feed. Two common raw materials have a particular impact on the accounts – soy products, of course, but also palm oil. Several companies, therefore, looked at other fat sources or reduced the fat content significantly to achieve a lower climate footprint. Soy products have a high footprint, especially when the effect of changed land use is included. When the content of the two raw materials is reduced or excluded, it is possible to reduce the feed's carbon footprint by up to 50 per cent including changed land use and 20 per cent excluding changed land use.

	Control	DLG	Danish Agro	BAT Agrar	Hedegaard
Feed intake, FU finisher/day	2.99	2.84	2.98	2.87	2.92
Daily gain, g	1116	1062*	1104	1066*	1152*
Feed consumption, FU finisher/kg daily gain	2.68	2.67	2.70	2.69	2.55*
Meat percentage, %	61.8	61.9	61.0*	62.0	61.5*
Production value per pig, index (same feed price)	100	97	95*	95*	109*
CO2e per FU/finisher	1.05	0.48	0.49	0.44	0.68
CO2e per kg daily gain 30-115 kg	2.81	1.28*	1.32*	1.18*	1.72*
CO2e per kg daily gain 30-115 kg, index	100	46*	47*	42*	62*

*Table 1 Each company was compared with the control group. There are no comparisons between the companies. A * denotes a significant difference relative to the control results*

More pigs fit to be sent to slaughter

A NEW STUDY FROM SEGES INNOVATION SHOWS A NEED FOR BETTER GUIDANCE AND ADJUSTMENTS TO STRENGTHEN LEVELS OF AGREEMENT IN THE TRANSPORT ASSESSMENTS OF PIGS. THE GUIDELINES NEED TO BE IMPROVED SO THAT A SMALL NUMBER OF PIGS CURRENTLY IN THE GREY ZONE OF DISAGREEMENT CAN BE SENT FOR SLAUGHTER.

Before a pig is sent for slaughter, it is assessed by people from different professional groups. Currently, several guidelines are in place for when pigs with minor injuries can and cannot be transported. For a small number of pigs there is doubt, and despite the guideline instructions, doubts and disagreements can easily arise as to whether such a pig is suitable for transport.

LACK OF AGREEMENT

SEGES Innovation has studied assessments by producers, drivers and practicing veterinarians of suitability for transport of pigs with hernias, tail bites or lameness. The participants from the three groups watched a series of video clips of pigs with different degrees of injuries or disorders and gave their assessments of the pigs' suitability for transport.

At least 20 people from each group gave assessments of the individual video clips. In general, pig producers, drivers and practicing veterinarians were found to be 'less in agreement' to 'moderately in agreement' in their assessments of whether a pig with a hernia, tail bites or lameness was suitable for transport.

The conclusion was that the levels of agreement between the professional groups were roughly similar, but some disagreement was found within individual groups.

"Our aim with the survey was to gain objective information about the levels of agreement in transport assessments between and within the professional groups that deal with the transport of pigs on a daily basis. This information makes it possible to determine whether we need to pay more attention to specific professional groups or disorders as far as guidance and adjustments are concerned," says Tina Birk Jensen, Chief Adviser and Veterinarian at SEGES Innovation.

"This study was also intended as a springboard for improving and revising existing guidelines."

DATA ON PIGS WITH HERNIAS

Pigs with hernias pose challenges under current guidelines, particularly with respect to the rules on transport. Pig producers are often frustrated when slaughter-ready pigs with minor injuries on their hernial sac must be culled because they cannot be transported.

"Right now, a pig with an injury on its hernial sac cannot be transported, partly because of the risk of the injury bursting open. Culling takes place regardless of size, location, or severity," explains Niels-Peder Nielsen, Chief Adviser, Danish Agriculture & Food Council.

"We completely agree that pigs with hernia injuries must not be stressed during transport. But we need professional data about the risk of types of injury. This knowledge is needed for this area of the guidelines to be revised."

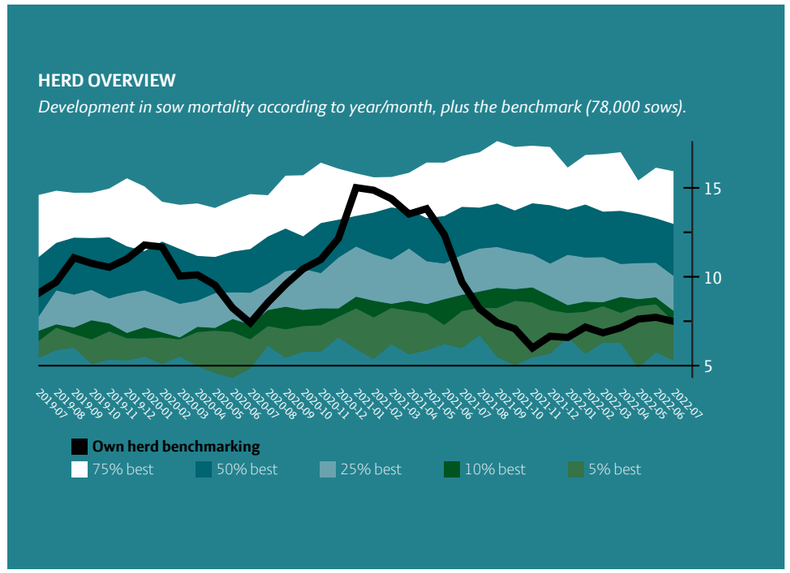
DISTINGUISHING BETWEEN INJURIES

The Danish Agriculture & Food Council has therefore launched a study into whether it is possible to distinguish between minor injuries on the hernial sac which do not cause pain and significant distress to the pig, and serious injuries that should preclude the pig from being transported.

The investigation will determine the need for any revision of the guidelines for the transport of pigs with hernias. If the results show that the welfare risk of transporting pigs with certain types of hernia is limited, the Danish Agriculture and Food Council will initiate a dialogue with the Danish Veterinary and Food Administration about changing the guidance.

"If this is the outcome, we must get this knowledge about hernias out to the Danish producers and hopefully get more pigs to the slaughterhouse. It will benefit the producers' bottom line, but also reduce waste of resources and benefit the sustainability agenda," concludes Niels-Peder Nielsen.

> "We completely agree that pigs with hernia injuries must not be stressed during transport. But we need professional data about the risk of types of injury. This knowledge is needed for this area of the guidelines to be revised.
>
> *Niels-Peder Nielsen, Chief Adviser, Danish Agriculture & Food Council*



Tools for better sow survival

NEW TOOL FROM SEGES INNOVATION SHOWS THE REASON FOR A SOW'S DEATH AND WHEN IT OCCURRED. THE TOOL ALSO ENABLES PRODUCERS TO MEASURE THEMSELVES AGAINST THEIR COLLEAGUES IN THE INDUSTRY.

It is sometimes difficult for pig producers to see what they can do to increase sow survival. SEGES Innovation has therefore made it easier to form an overview over a sow herd by using entries from management software which is already in use on the farm.

Claus Blumensaadt and his veterinarian have put the registration system to good use. He has a sow herd of 750 sows on his farm, Gammeleje, near Egtved in Jutland and is firmly focused on keeping sow survival rates high.

"We look at the figures once a month and question why we have lost an individual sow. The vet is a good sounding board and helps us with some fine-tuning so that our mortality is kept at a low level in relation to the benchmark figures. Nevertheless, it's crucial that we get out into the housing units, check our sows, and react to any changes in behaviour," says Claus Blumensaadt.

DATA ANALYSED BY VETS

Anders Elvstrøm, a member of Danvet, is the veterinarian attached to the farm. He points out that Claus Blumensaadt's focus on caring for his sows on a daily basis is the reason why sow mortality is 7 per cent.

In the data overview, a death can be divided into natural causes or euthanasia as well as where in the cycle the death occurred.

"Culling often relates to leg problems. In the event of a death, this is often related to an issue with feed. So I have a good feel for where the farm should devote its efforts to increase sow survival. But it is a challenge to see the cause of a sow's death yourself unless the vet performs an autopsy," says Anders Elvstrøm.

REINFECTION WITH MYCOPLASMA TRIGGERED ACTION

About two years ago, the herd was reinfected with mycoplasma, and many sows died.

"Afterwards, we could see from the data when mycoplasma had started. By the end of 2020, sow mortality had risen significantly until we saw the clinical signs of the disease. We learned the hard way that it was important to act on what the animals' behaviour was telling us," explains Claus Blumensaadt.

This meant that the farm manager had to introduce new work procedures, which they have retained ever since. The new routines involve two to three employees feeding and attending to the sows in the gestation unit. The priority is to have enough time to check the animals before the mid-morning break. After this, the unit is basically quiet for the rest of the day.

Before the outbreak of mycoplasma, sow mortality was around 10 per cent, which is 3 percentage points higher than the farm's current sow mortality.

"It's about intervening at the right time. When we see a sow that is lame or injured in some other way, it's better to act sooner rather than later. We put the sow in a relief pen with other weak sows and gilts until she is ready to move to another collecting pen. Every Thursday, the new weekly batches are moved and assembled, which is the responsibility of Andrii, our farm manager, who has been with us for eight years," says Claus Blumensaadt.

COMPARE YOURSELF WITH OTHERS

The registration system enables those at Gammeleje to compare themselves with other farms that use the software. In this respect, Claus Blumensaadt's farm is among the 5 per cent best.

"It's great that we can see that we can keep sow mortality at a low level. It's a good motivator for me and the team to see our ranking in the graph. It makes me proud and happy to register sows for slaughter rather than for their carcases to be collected by DAKA.".

Half of Danish farms use DANISH Boksen

THE DIGITAL DOCUMENT MANAGEMENT SYSTEM, DANISH BOKSEN, EASES THE DAILY GRIND AND GIVES PIG PRODUCERS PEACE OF MIND. THE PLATFORM IS CONSTANTLY EVOLVING – MOST RECENTLY WITH THE ADDITION OF A NEW MODULE FOR COMPLETE ORGANISATION OF PRODUCERS' SPECIAL DANISH PIG PRODUCTION DOCUMENTATION IN ONE PLACE.

To get rid of the many ring binders, paperwork and documents, DANISH and the Danish Agriculture & Food Council Pig Research Centre have made it easier to get a handle on the documentation and peace of mind during audits.

Close to 1,000 pig producers have signed the declaration of consent and uploaded their first documents to the platform less than a year after its launch in October 2021. One of them is Jakob Nielsen, Operations Director at FM Pork at Bregentved estate. The farm operation he runs supplies 125,000 finishers annually. Easy record keeping with the ability to generate a documentation overview is important in case of a visit from the authorities or DANISH as well as for the farm itself.

"We're very happy that we can collect all our documentation in one place and receive notifications if something needs to be updated. It provides an excellent overview and peace of mind knowing that everything is up to date," says Jakob Nielsen.

Trouble free record keeping

The certification body for the DANISH scheme shares the enthusiasm. Jesper Bækgaard, Baltic Control Certification auditor, explains that farms where DANISH Boksen has been implemented benefit from constant updating of the documentation required for DANISH certification.

"In our experience, farmers using DANISH Boksen have taken care of all requirements in the DANISH Product Standard. When we perform checks, the documentation can generally be a challenge for us as well as the farmer. It can be time consuming to find the physical documents that we require. For DANISH Boksen users, I find that the platform provides easier access to the documents and a high level of confidence for the user during the control process," says Jesper Bækgaard.

UK PIGS AS ADDITIONAL MODULE

The latest DANISH Boksen addition is a module that takes care of the additional documentation required from DANISH pig producers.

"The supplementary module for DANISH pigs is in great demand. This special production requires annual inspection and certification renewal and is subject to additional administrative requirements," says Thea Larsen, Senior Adviser at the Danish Agriculture & Food Council.

The DANISH module offers custom settings for delivery to Tican or Danish Crown as well as notifications for updating the DANISH pig documentation.

TIME-SAVING AND EASY

"I think it's great that DANISH Boksen offers a module for UK pigs. This means that we do not need to handle these documents separately. In general, we try to keep all our documentation in DANISH Boksen, just to have it in one place," says Jakob Nielsen.

He explains that the ease of entering photos and documents in Danish Boksen is important to him and his team at FM Pork. In addition to the DANISH module, DANISH Boksen developed a scanning app earlier this year that makes it easy to take pictures and upload documents directly to the platform from your phone. This reduces the risk of something being forgotten or lost in the housing unit.

PLATFORM REQUESTS CONTINUOUSLY FULFILLED

DANISH Boksen continues to evolve. Automatic transfer of veterinary documents, such as prescription forms, visit reports and quarterly reports is one feature requested by users. It has now become a reality on the platform. Another is a feature for owners to grant temporary access to others, such as an adviser or a vet.

Automatic document sorting for folders and more templates that can be directly uploaded are among other features in the works. In addition, owners will be enabled to benchmark their farm, track deviations identified during DANISH audits, and connect DANISH Boksen to other databases.

> We're very happy that we can collect all our documentation in one place and receive notifications if something needs to be updated. It provides an excellent overview and peace of mind knowing that everything is up to date.
>
> *Jakob Nielsen, Operations Director at FM Pork at Bregentved estate*

Welfare and survival are the DNA of the future DanBred pig

THE BREEDING PROGRAMME WORKS TO INCREASE THE SURVIVAL OF FINISHERS AND SOWS IN A TARGETED WAY. MOREOVER, WE AIM TO IMPROVE A SOW'S MOTHERING ABILITIES SO THAT SELF-WEANING IS INCREASED.

Sows, piglets and finishers will have a better starting point genetically. In short, future research will focus on the survival of sows, piglets and finishers. New technology and data have made it possible to measure other parameters that benefit breeding progress and provide more secure breeding values. The research is in its infancy, but has already shown promising results for the development of breeding progress and will benefit Danish pig producers' profitability.

SURVIVAL UNTIL SLAUGHTER

Survival until slaughter is a research project carried out by Aarhus University and the Danish Agriculture & Food Council Pig Research Centre. The aim is to find out whether there is a genetic connection between survival until slaughter and other traits in DanBred's breeding goals and to develop the necessary breeding tools to increase survival. This will benefit the pig producer financially in that fewer pigs will die and improve the health and animal welfare of piglets and finishers.

Preliminary results have shown that heredity for survival until slaughter is 1-2 percentage points. Although heredity is low, the estimated breeding value figures for the trait have been shown to have a high degree of certainty. This means that it can have a direct effect on the trait's potential breeding progress.

BETTER SOW SURVIVAL

In addition to survival until slaughter, sow survival has long been a topical issue. The trait has already been part of the breeding goal for DanBred Landrace and DanBred Yorkshire for more than 10 years. Today, sow survival is defined as the probability that a multiplier sow will be serviced after the first litter and an indicator of the production sow's longevity. Aarhus University and Danish Agriculture & Food Council's Breeding & Genetics, Pig Research Centre have studied how data from zigzag crosses in production herds can be used to optimise the trait.

"The first analysis aimed to investigate whether the genetics behind the current trait for sow survival is the same as the genetics behind sow survival measured in production herds. The analysis showed that the traits had a genetic correlation of 17-23 per cent. This emphasises that the traits' genetic backgrounds are not 100 per cent the same, and that there is therefore potential for using production data for breeding for longevity," explains Bjarke Grove Poulsen, Senior Scientist at Danish Agriculture & Food Council.

The aim now is for the new trait for sow survival to be ready for implementation in the DanBred breeding goals.

THE SOW'S MOTHERING ABILITIES IMPROVE SUSTAINABILITY

The sow's mothering abilities are also one of the traits that will claim more attention in the future breeding programme. In a pilot project involving DanBred Landrace and DanBred Yorkshire pregnant with crossbred pigs, the focus was whether it was possible to increase litter weight at weaning via the dam line, and whether the sow could mother more pigs.

The results showed that that it is possible to breed for increased litter weight at weaning. The trait can both have economic and sustainable benefits for piglet production and ease the workload since the breeding work for this trait will reduce the need for nursing sows.

The value of increasing the litter weight by 1 kg proved to be DKK 0.75 per finisher.

"There is the potential for improved sustainability by increasing the litter weight of weaned pigs. This results in better mothering abilities, which also results in less need for nursing sows. In the final analysis, this contributes to more sustainable production," says Anders Vernersen, Head of Department, Breeding & Genetics, Danish Agriculture & Food Council.

The next step after the pilot study is a more in-depth study with data from breeding herds. Over the coming years, Breeding & Genetics, in partnership with Aarhus University, will carry out a thorough investigation of the trait. The aim is for the sow's mothering abilities to become part of the breeding goals.

> "The analysis showed that the traits had a genetic correlation of 17-23 per cent. This emphasises that the traits' genetic backgrounds are not 100 per cent the same, and that there is therefore potential for using production data for breeding for longevity.
>
> *Bjarke Grove Poulsen, Senior Scientist at Danish Agriculture & Food Council*

> In order for pigs to have increased zinc intake, they must learn to eat as much feed as possible before they are weaned. This makes it possible to ensure a high feed intake after weaning which also helps to increase a pig's zinc level.
>
> *Hanne Maribo, Chief Scientist at SEGES Innovation*

Zinc is still important for pigs

THE NEW LIMIT VALUE FOR THE CONTENT OF ZINC IN FEED MAKES IT DIFFICULT FOR NEWLY WEANED PIGS TO HAVE THEIR ZINC REQUIREMENTS COVERED WHEN THEY ABSORB SMALL AMOUNTS OF FEED POST WEANING. A LOW LEVEL OF ZINC CAN IMPACT A PIG'S DIGESTION, IMMUNITY AND DAILY GAIN.

After 26 June 2022, pig feed may contain no more than 150 ppm of zinc. This level can risk piglets being under supplied in the first weeks after weaning. In several projects, SEGES Innovation and Aarhus University have studied how piglets are affected by the addition of various levels of zinc.

"Zinc is important in ensuring many of the body's functions, including digestion, growth and immunity as well as enzymes. Moreover, zinc is only stored in the body in very small quantities. It is important, therefore, that the mineral is supplied on a daily basis," explains Hanne Maribo, Chief Scientist, SEGES Innovation.

ALTERNATIVE TO ZINC OXIDE

SEGES Innovation and Aarhus University carried out a small-scale preliminary study of six different sources of zinc. The purpose was to document how different sources of zinc impact a pig's zinc content in its blood, its feed intake and growth as well as zinc's digestibility. The zinc sources were added to a basic mixture at 100 ppm so that the feed's total zinc content was close to 150 ppm, including the natural content of the raw materials. 1,000 ppm was added in two groups. The pigs were part of the trial in the first three weeks after weaning and were housed individually.

"An alternative to zinc oxide, which has a low digestibility rate, could be to use a zinc source which is more digestible for the pig. In collaboration with Aarhus University, we have studied whether there is a difference between some of the zinc sources that are on the market," says Hanne Maribo.

SAME FEED INTAKE AND GROWTH

The zinc sources that were tested in the preliminary study were zinc oxide and zinc sulphate added at 100 and 1,000 ppm and E.C.O. Trace®, Avila Zn, Hydroxy zinc, HyZoX added at 100 ppm. The difference between the zinc sources is that zinc is bound in different ways, which could affect digestibility. The results showed that the various zinc sources produced similar feed intake and growth. In the 21 days of the trial, feed intake was between 250-350 g/day and growth between 200-300 g/day on average. Zinc excretion from the pigs' faeces was highest at 1,000 ppm, but there was no difference in the zinc excretion when 100 ppm of the sources was added - irrespective of the zinc source.

"In the first two weeks post weaning, zinc excretion was higher than the intake when 100 ppm zinc was added. There was no difference in the blood's zinc content by adding 100 ppm of the various zinc sources," explains Hanne Maribo. She confirms that 100 ppm of zinc is not enough to meet Aarhus University's recommendations to achieve maximum growth in the first 14 days after weaning.

The next step is to select two zinc sources for large-scale testing in a herd, measuring diarrhoea and growth.

PIGS MUST LEARN TO EAT MORE

Previous results from Aarhus University showed that feed for piglets in the first two weeks post weaning must contain 1,400-1,500 ppm zinc oxide in order for the pigs to have the highest daily gain immediately after weaning.

"In order for pigs to have increased zinc intake, they must learn to eat as much feed as possible before they are weaned. This makes it possible to ensure a high feed intake after weaning which also helps to increase a pig's zinc level," explains Hanne Maribo.

THE DIFFERENT SOURCES OF ZINC ARE:

- **Inorganic:** ZnO and ZnSO4 – inorganic zinc sources which have a low availability
- **Organic:** Zinc is bound to various organic compounds.
- **Chelated:** Zinc is in a chemically inactive form.
- **Coated:** Zinc is encapsulated in carbohydrate or protein.
- **Hydroxy:** Zinc is bound in a special chemical structure.
- **Micronised:** The zinc source is in a form where the particle size is extremely small (1-100 nm).

Calculate your farm's climate impact

ESGREEN TOOL WILL MAKE IT EASIER FOR PIG PRODUCERS TO TAKE ACTION ON A NUMBER OF FRONTS TO REDUCE THEIR FARM'S CARBON FOOTPRINT. A CALCULATION TOOL MAY MAKE THE CLIMATE LABELLING OF A PIG POSSIBLE IN FUTURE.

Collaboration along the value chain is needed if reducing the CO2 equivalents in Danish pig production is to succeed, especially with regard to feed composition. To calculate a farm's carbon footprint, feed companies need to supply the figures for the carbon footprint of feed and feed mixes while advisers calculate the carbon footprint of home-mixed feed. The figures will be included in the digital climate tool, ESGreen Tool, which collects all data and calculates the farm's overall carbon footprint.

"It is quite clear that when we calculate the farm and the pig's carbon footprint, the farmer bears substantial responsibility across the product chain. The improvements that are made have an almost 100 per cent impact on pig meat itself," explains Finn Udesen, Senior Adviser at the Centre for Climate & Sustainability at SEGES Innovation.

SEVERAL FACTORS COME INTO PLAY

Some of the factors that impact the carbon footprint and are included in the ESGreen Tool are feed rations, feed consumption, daily gain and housing as well as slurry systems. And at the slaughterhouse, factors such as the utilisation of the pig, resource consumption and the handling of waste also have a decisive impact.

The ESGreen Tool offers an overall calculation of a farm's carbon footprint, which is the number of CO2 equivalents for the whole farm – including the distribution of methane, CO2 and nitrous oxide. Various scenarios also provide an overview of the CO2 reducing tools with the greatest effect.

Finisher producer Jens Gudike Fly Christensen from Enghave north of Skive in Jutland has helped to provide input for the ESGreen Tool calculation model. He has already given some thought to what can be done on the farm to reduce its carbon footprint.

"From my perspective, it is interesting that feed has such a big impact on a pig's carbon footprint. So yes, feed, but also slurry management, are probably the two areas I would focus on to reduce the carbon footprint of the pigs on my farm," he says.

Among the technical environmental measures is the frequent discharge of slurry, particularly with a winch-driven cleaning system, one of the climate measures that can be deployed in most housing units with slurry systems. The impact of frequent discharge is particularly significant if fresh slurry is rapidly supplied to the biogas plant. The use of other environmental technologies such as slurry cooling and housing acidification may also have a positive impact on the climate accounts.

FEED COMPONENT TABLE FOR CLIMATE OPTIMISATION

Feed has the greatest impact on pig production's carbon footprint and a significant difference can be made in this area when it comes to reducing livestock production's carbon footprint, including pig production.

In collaboration with the feed industry, SEGES Innovation is in the process of expanding the number of Danish feed components in the GFLI feed database, which contains environmental and climate values. The database is used to calculate and report the carbon footprint of feed based on the EU's Product Environmental Footprint (PEF) rules, and currently contains 1,000 components.

The idea is to create a more comprehensive carbon calculation of feed components and thus a carbon-optimised feed mixture that can be used in pig production.

"But it would be wise at this stage to think about how feed can be adjusted to reduce its carbon footprint. For example, feed can be made more climate friendly by producing more protein crops and increasing feed efficiency. It all helps to influence the overall carbon footprint," explains Finn Udesen.

CLIMATE LABELLING IN FUTURE

ESGreen Tool will provide calculations of the carbon footprint of sows, piglets and finishers for organic and conventional herds.

In future, ESGreen Tool will enable slaughterhouses to use a pig's carbon footprint so that consumers can refer to a climate label when shopping for minced pork in the supermarket for instance.

READ MORE ABOUT THE MEASURE IN NOTAT NO 2118, "Tools for carbon reduction on pig farms".
svineproduktion.dk/publikationer/kilder/notater/2021/2118

> I'm very much in favour of the basic idea that more piglets should remain with their own sow. If the Comfort Cradle gets into production,they will eliminate the need for nursing sows and the fewer nursing sows there are, the more stable production is.
>
> *Kristian Vinther, farm manager at Overgaard and participant in the ComfortCradle trial*

Loose-housed sows offer new opportunities

PEN DESIGN, MONITORING AND ALLOCATING SUPPLEMENTARY NUTRITION TO PIGLETS ARE AMONG THE ASPECTS THAT A FUTURE PIG PRODUCER WILL NEED TO TAKE INTO ACCOUNT WHEN WORKING WITH LOOSE-HOUSED LACTATING SOWS. THE FINDINGS ARE THE RESULTS OF PROJECTS SET IN MOTION BY SEGES INNOVATION AND ITS PARTNERS.

The Danish Agriculture & Food Council Pig Research Centre recommends that newly built housing systems should be designed for loose-housed sows. In Germany, loose-housed systems will be required for lactating sows by 2036.

SEGES Innovation is taking a multipronged approach in order to bring about good and efficient solutions for producers, sows and piglets when a switch away from farrowing pens has been decided and new work procedures need to be introduced. The aim is to find solutions that address animal welfare, climate impact and cost.

The following provides the latest insight into the solutions that can, or will be, adopted by Danish pig producers.

WELFARE VERSUS CLIMATE IN THE FARROWING PEN

In farrowing pens, sows defecate, rest and eat in the same position. When sows are loose, they can move away from their eating and rest area to defecate. If slatted flooring is installed in the pen, emissions will rise as the slurry surface is increased. A pen with a partially solid floor therefore makes good sense. A solid floor also enables a good lying area to be provided for the sow and for rooting and enrichment material to be offered to the sow and her piglets.

One of the challenges involves keeping the solid floor clean. The GUDP project, SOWEMIS, seeks to address the challenge of sow welfare and reduce emissions. A number of options are being worked on that will motivate the sow to position her body when defecating. One finding to emerge at this stage is that a rectangular pen is preferable to a square one. A rectangular design allows for the pen to be divided into various zones more successfully, which means that the sow can be encouraged to use the zones for eating, resting, and defecating respectively.

STALLS SAVE LIVES

In the balance between the freedom of the sow and the risk of piglets being crushed to death, research shows that it is better to use stalls in the critical 2-4 days after farrowing. Monitoring tests carried out by SEGES Innovation show that even though the sow is loose for the first two days after farrowing, it remains completely still for more than 90 per cent of the time. The effect on the sow of being in a stall in the initial days post farrowing is minimal whereas she saves piglets' lives – which benefits animal welfare and the producer's bottom line.

ARTIFICIAL TEATS

To enable the sows to move around, farrowing pens for loose-housed sows are larger than stalls. Extra space can be used to put more piglets to the sow. Studies are therefore being undertaken to enable the sow to look after larger litters. SEGES Innovation and Aarhus University have together developed a prototype known as the Comfort Cradle with artificial teats that enables piglets to take turns at suckling in the first 24 hours post farrowing. In one experiment, for example, the pigs were put in the Comfort Cradle to suckle for the first eight hours after farrowing. They gained weight as a result. In another experiment where the litter consisted of 18 pigs, 12 were put to the sow while six were put in the Comfort Cradle. All the piglets survived in the first three critical days after birth.

The participant in the trial at Overgaard farm is enthusiastic about the product:

"I'm very much in favour of the basic idea that more piglets should remain with their own sow. If the Comfort Cradle gets into production, they will eliminate the need for nursing sows and the fewer nursing sows there are, the more stable production is," says Kristian Vinther, farm manager at Overgaard.

The solution requires further development, more working hours, and investment in equipment. In return, nursing sows and all the work that this involves will be eliminated.

IDENTIFY SICK SOWS BEFORE THEY CRUSH THEIR PIGLETS

In the case of loose-housed sows, only a few – and, in particular, sick – sows crush their piglets. An effort to identify such sows would clearly pay off. Trial results show that both surface thermometers and small rectal thermometers are not the answer to identifying which sows are sick. A longer thermometer, which takes deeper measurements, should be used and other clinical signs should be observed.

The right pre-farrowing feed strategy can potentially increase piglet survival

TRIALS AT AARHUS UNIVERSITY AND SEGES INNOVATION SHOW PROMISING RESULTS FOR PIGLET SURVIVAL BY FOCUSING ON SOW FEEDING IN THE DAYS BEFORE FARROWING.

A new feeding concept for sows has been shown to reduce the number of stillborn pigs. The Born2Live project examines to what extent a change in the feeding strategy up to farrowing can increase piglet survival both in terms of fewer stillborn pigs and a higher survival rate post farrowing. The project is a collaborative project between SEGES Innovation, Aarhus University and Vestjyllands Andel.

3 FU/sow of weaning feed were allocated per day, which was supplemented with 1 FU/sow per day of a feed supplement. This reduced the number of stillborn pigs by 1.7 percentage points among 3-7 litter sows.

"SEGES Innovation previously recommended reducing the feed allocation to 3.0 feed units per day in the days leading up to farrowing. We now recommend giving the sows 3.5-4.0 feed units per day from the time of transfer to the farrowing unit until farrowing. This is to ensure that the sows have enough energy to go through a quick and uncomplicated farrowing," says Camilla Kaae Højgaard, Senior Adviser, SEGES Innovation.

MORE FEED, SHORTER FARROWING

Born2Live is a feeding project that stemmed from a study carried out at Aarhus University. The study showed that the length of farrowing and the number of stillborn pigs were low when sows started farrowing no later than 3 hours after the last feed. This indicates that the sows run out of energy during farrowing.

The initial trials carried out by the university showed that a higher feed strength should be given to sows from the time of their transfer to the farrowing unit until the end of farrowing in order to reduce the need for farrowing aid and ensure a rapid farrowing.

In addition to feed strength, it was expected that the source of fibre used in the feed prior to farrowing would impact a sow's ability to maintain a stable blood sugar level. Aarhus University, therefore, also examined different fibre sources and found that the length of farrowing was reduced when sugar beet pellets or a fibre mix consisting of mainly beet pellets and oat bran flour were used.

LARGESCALE TRIAL

SEGES Innovation has carried out a largescale trial. The sows in group 3 (fig.1) were fed 4 feed units for a minimum of 3 days before farrowing, of which 1 feed unit was replaced with specially designed feed supplement. Group 3 was found to have 0.4 fewer stillborn pigs per litter than sows in group 1 fed 3 feed units of nursing feed per day. There was no difference between groups 1 and 2.

The results showed that the number of stillborn pigs out of the total births in the trial groups 1,2 and 3 was 11.8, 10.8 and 10.1 per cent in 3-7 litter sows (fig.1). Converted, this corresponded to 2.6, 2.4 and 2.2 stillborn pigs per litter respectively.

FEED IS NOT ENOUGH

If the stillborn pigs are to be changed into liveborn pigs, it is important to focus on management in early nursing. A new pre-farrowing feeding strategy is not enough. The results show that management is crucial for the additional liveborn piglets to survive post farrowing.

"Farms with a strong focus on the management of newborn pigs will particularly benefit from the new feeding strategy as more live births will result in more weaned pigs per litter. In the trial carried out by SEGES Innovation we monitored the piglets until day 5 and overall piglet mortality, including stillbirths, was not reduced as some of the pigs that would otherwise have changed from stillborn to liveborn did not survive early nursing," says Camilla Kaae Højgaard.

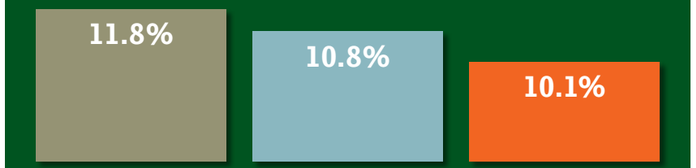
FEEDING CONCEPT FOR EARLY GESTATION DOES NOT INCREASE BIRTH WEIGHT

In another research project, Feed4Life, the aim was to study whether by adding changed concentrations of specific nutrients for the sow in early gestation, the birth weight of the piglets could be increased and thus increase survival.

The project was a collaboration between Copenhagen University, DLG and SEGES Innovation. Initially, Copenhagen University produced interesting results by using large quantities of omega-3 fatty acids and antioxidants in the feed. The developed feeding concept with a practical level of omega-3 fatty acids and antioxidants was tested on a large scale in two production herds. This showed that the selected feeding did not affect the birth weight.

"The feeding concept in Feed4Life was unable to increase the birth weight. Increased focus on the development of follicles even before service is something that will require more research in the future," says Thomas Sønderby Bruun, Chief Adviser, SEGES Innovation.

STILLBORN PIGS, % OF TOTAL BORN



SEGES Innovation has studied how different feeding strategies affected the number of stillborn pigs with 3-7 litter sows. There is a statistically safe difference between Groups 1 and 3, but not between Groups 1 and 2. The trial was not designed to test between Groups 2 and 3. From the time of transfer into the farrowing unit and until the end of farrowing, a minimum of 3 days before farrowing however, the sows were divided into three groups.

Group 1: 3 feed units nursing feed per day
Group 2: 4 feed units nursing feed per day
Group 3: 3 feed units nursing feed and 1 feed unit of a specially designed feed supplement per day. The feed supplement diluted the nursing feed as it did not contain soybean meal, but wheat, beet pellets, oat hulls, and cake mix.

FEEDING STRATEGY FOR REDUCING STILLBORN PIGLETS

> SEGES Innovation recommends giving sows 3.5-4.0 feed units per day from transfer into the farrowing unit until farrowing, but at least 3 days before farrowing. A dilution of the protein content in nursing feed at the same time as a changed fibre composition reinforced the effect of increased feed strength on the number of stillborn pigs.

> Beet pellets and fibre mix (mainly beet pellets and oat hulls) minimised the need for farrowing aid.

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