

## Comparison of Organic swine production data across 6 different organic farms



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**Summary**

Production data from 6 different organic swine farms was collected for a previous study in 2015 and 2016.

To maintain farmer anonymity, farms are labeled as Farm A – F. The farms range in size from about 150 to 630 sows, from across Denmark.

The production data for sows indicate an average on 22.3 weaned piglets per sow per year, which are 11.1 per litter. The feed consumption is on average 1980 Danish feed units per sow per year, with a variation between 1803-2150 feed unit per sow per year.

Slaughter pig production results show an average feed utilization rate of 3.07 Danish feed units per kg gain. However, the numbers are biased because of a big variation in the start weight of the pigs. The meat percentage is on average 59 percent, with a variation of between 57.4-59.9 percent.

*Conclusion*

Overall, there are several areas on which Danish organic swine farmers should focus, in order to improve their production. Particularly the number of piglets weaned per sow per year and the feed utilization rate.

## **Purpose**

The purpose of this study is to compare the production data of 6 different organic farrowing to finish pig farms to each other, and to the average of other European countries in terms of production statistics and nutrient management.

## **Methods**

Danish organic lactating sows have access to pasture year-round, except during the insemination period, in which they are group-housed indoors. Piglets are born and reared on pasture in huts, and are not weaned until at least 7 weeks old. All pigs have access to roughage in form of pasture or silage, as well as the outdoors year-round, via pasture or outdoor pen access.

Production data from 6 different organic swine farms was collected for a previous study over 2015 and 2016. To maintain farmer anonymity, farms will be labeled as Farm A – F. The farms range in size from about 150 to 630 sows from across Denmark. However, since the data was originally collected for a previous study, the data is somewhat incomplete. As such, Farm D had none of the necessary data for this study in its file and was excluded. Some farms had data for both 2015 and 2016, but in most cases data was only available for either 2015 or 2016. Animal production data was compiled for sows, weaners, and finishers. However, only Farm E had separate and complete data on piglets, and therefore this data will not be presented in the report. Data consisted of averages for each quarter, as well as a year's average. While mainly yearly averages will be presented, quarterly averages will be used for determining minimum and maximum values. For sows, production data was compared for feed per sow per year, weaned piglets per sow per year, lactation period, weight at weaning (kg), dead until weaning (%), non-productive days per litter, and farrowing percent. Farms B, C, E, and F had complete data and Farm A had partial sow production data. For finishers, production data was compared for average start weight (kg), dead (%), rejected at slaughter house (%), daily gain (g), feed utilization, carcass weight, and meat percent (%). Health data at slaughter was also examined for pleurisy, tail biting, and wounds inflammation/infection. Only Farm C and F had complete data, Farm A, B, and E did not have information on carcass weight, tail bit, and wounds inflammation/infection.

Farm data on nitrogen and phosphorus levels in feed and manure was collected to analyze nutrient management and cycling. Only Farm A and E had feed data available. However, complete manure data was available for Farms A, B, C, and E. Although manure was originally reported in kg, the manure data is presented here as kg/animal since each farm varies in size. Other animals present on the farms, such as layers and horses, were also included in the original manure data, but will be excluded in this report. Manure data will not be reported by year, as no farm had a data report for both 2015 and 2016. However, feed and manure reports for Farm A were both from 2015 and for Farm E were both from 2016. This made comparisons within each farm possible, but not across farms.

Further data will be compiled from literature on several European countries to provide a basis for comparison.

## Results

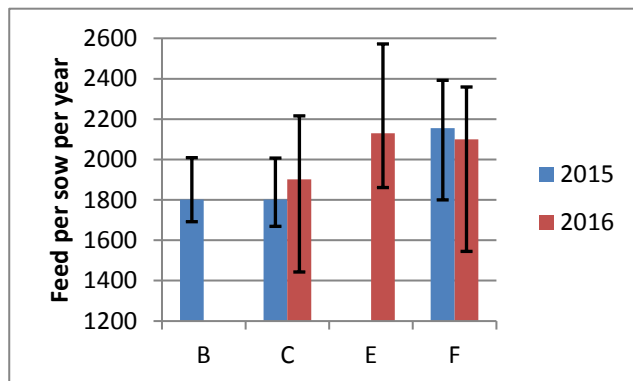
### Sows

**Table 1: Sow production data by farm and yearly average.**

Production	Unit	A	B	C		E	F	
		2015	2015	2015	2016	2016	2015	2016
Feed per sow per year	FE	ND	1803	1805	1902	2127	2150	2095
Weaned pig per sow per year	No.	10.6*	20.7	22.8	22.0	23.6	23.1	21.6
Herd size	No.	150	268	435	463	631	306	320
Lactation period	Days	49.0	52.0	52.0	53.0	53.4	51.0	50.9
Weigh at weaning	Kg	14.0	12.1	13.8	13.8	13.1	13.2	13.0
Dead until weaning	%	20.0	18.0	25.2	24.6	21.3	20.0	19.7
Non-productive days	Day	ND	33.0	13.0	22.0	20.7	16.0	23.1
Farrowing percent	%	ND	76.0	86.8	87.2	83.1	80.9	75.9

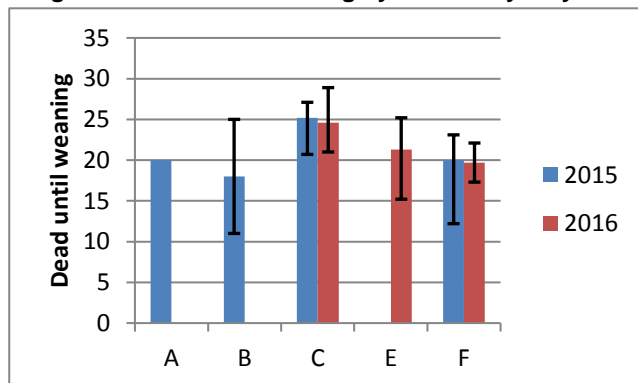
ND= No Data, \*Value is per litter since per year data was not available.

**Figure 1: Feed per sow per year by farm and yearly average.**



Black bars indicate minimum and maximum values from quarterly data within the year.

**Figure 2: Dead until weaning by farm and yearly average.**



Farm A did not have quarterly data to calculate minimum and maximum values from

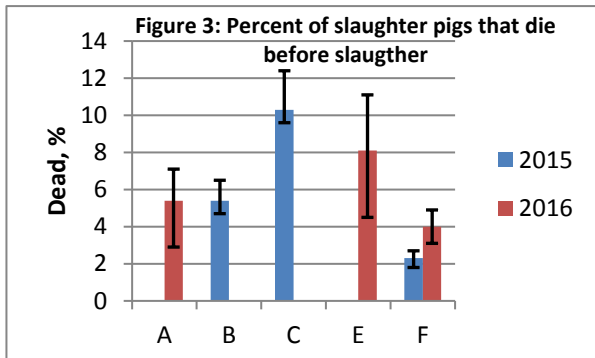
Table 1 shows that Farm B had the lowest feed per sow per year and Farm F had the highest. However, looking at Figure 1, there is a large variation in minimum and maximum values within the year. When averaging the values across farms and years for each quarter it is clear, that there is a seasonal effect. Fall/winter (quarter 1 & 4) has about 2000 FE and spring and summer (quarter 2 & 3) has about 1800 FE. Farm B also has the lowest weaned pigs per sow, weaning weight, and piglet death until weaning. However, Figure 2 shows that there is a large variation in Farm B's piglet death, with a maximum of 25% and a minimum of 11%. When looking at the quarterly data, there is a clear seasonal effect with summer having 14.6% in 2015 and 18.1% in 2016 compared to the fall with 25% in 2015 and 23.8% in 2016. Farm C had similar feed per sow per year and lactation period to Farm B, but had the highest weaning weight and highest piglet death until weaning in 2015. From 2015 to 2016, Farm C increased feed per sow per year resulting in an increase in farrowing %, and a decrease in piglet death, while still maintaining high weaning weights. Farm E had the highest weaned pigs per sow and the longest lactation period, but also the second highest feed per sow per year. In 2015, Farm F had the highest feed per sow per year, however decreasing in 2016. 2016 also had fewer weaned pigs per sow, shorter lactation periods, lower weaning weights, lower piglet death, more non-productive days, and a lower farrowing percent.

Slaughter

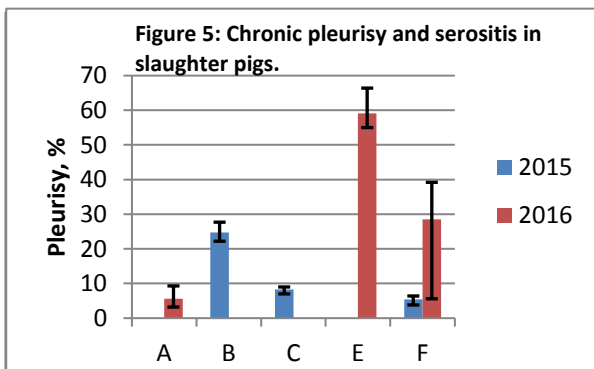
**Table 2: Slaughter pig production data by farm and by year.**

Production	Unit	A	B	C	E	F	
		2016	2015	2015	2016	2015	2016
Start weight	Kg	13.0	14.3	14.2	32.4	35.8	36.2
Dead	%	5.4	5.4	10.3	8.1	2.3	4.0
Rejected	%	0.1	0.1	0.1	0.2	0.1	0.1
Daily gain	g	821	718	697	836	957	812
Feed utilization	Fes	2.69	3.12	3.08	3.20	2.94	3.37
Slaughter	%	ND	ND	76.3	ND	76.3	76.3
Meat	%	57.4	59.9	59.8	59.5	58.9	58.7
<b>Remarks from abattoir</b>							
Pleurisy	%	5.6	24.7	8.3	59.1	5.4	28.5
Tale bid limited locally	%	ND	ND	4.6	ND	2.4	2.7
Wounds, inflammation, ec-zema	%	ND	ND	4.2	ND	ND	0.8

ND= No Data



Black bars indicate minimum and maximum values from quarterly data within the year



Black bars indicate minimum and maximum values from quarterly data within the year

Farms A-C categorized slaughter pigs as post weaning, and thus had a starting weight of 13-14 kg. Whereas Farms E & F had a defined piglet period after weaning, that ended at about 34 kg. The percent slaughter data was either not available or was a standard value used by farmers as an estimator since Farm C and Farm F both had 76.3% listed for every quarter. While looking at Table 2 it may appear that rejected is also just a standard value, but the value did vary across quarters with the highest being 0.3% and the lowest being 0%. Farm C had the highest death rate followed by Farm E, both were nearly double the rest of the farms. Although looking at Figure 3, this rate was highly varied across quarters, especially for Farm E. Daily growth rate also varied across farms and years; with the highest being Farm F in 2015 at 957 g., and the lowest being Farm C at 697 g. Farm F also had the second lowest Fes per kg. gain behind Farm A. However, Farm F lost this efficiency in 2016 with the highest Fes per kg. gain overall. Meat yield % was similar across farms and quarters. Farm B had the highest meat yield at 59.9%, and Farm A had the lowest at 57.4%. Health data at slaughter was also compiled, but not all codes were reported. The code for pleurisy and serositis varied a lot from farm to farm and year to year.



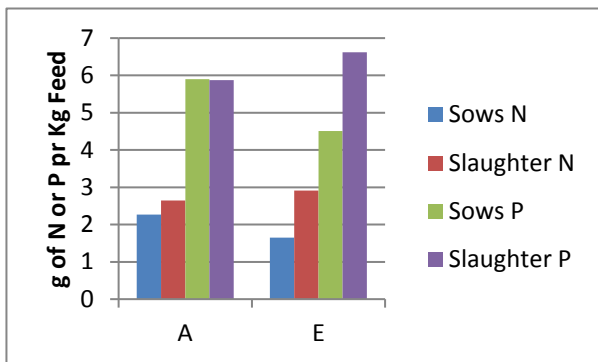
Manure

**Table 3: Kg of N and P produced per pig for each farm for a year.**

	A (2015)		B (2015)		C (2016)		E (2016)	
	N	P	N	P	N	P	N	P
Sows	11.65	2.95	11.66	3.00	12.44	3.46	12.31	3.33
Piglets	0.341	0.102	0.360	0.098	0.348	0.094	0.274	0.097
Slaughter	2.70	0.65	2.82	0.68	2.23	0.66	2.54	0.63
<i>Total</i>	<i>14.69</i>	<i>3.69</i>	<i>14.84</i>	<i>3.77</i>	<i>15.01</i>	<i>4.21</i>	<i>15.12</i>	<i>4.05</i>

Sows were the largest contributors to the total manure produced for both N and P. The levels for piglets are so small that it is unclear, if this is due to their smaller size or if there is an accuracy issue with the data. Farm A had the lowest N and P per sow, and Farm C had the highest. For slaughter pigs, Farm C had the lowest N, but Farm E had the lowest P. Farm B was the highest for both N and P for slaughter pigs. For piglets, Farm E had the lowest N, but Farm C had the lowest P. Farm B had the highest N, and Farm A had the highest kg. of P per piglet. Overall, Farm E produced the highest kg. of N per pig, Farm C produced the highest kg. of P per pig, and Farm A produced the lowest N and P per pig.

## Feed



Farm E had lower N and P in sow feed compared to Farm A, but had higher N and P in the slaughter pig feed compared to Farm A. Farm E's sow N and P is nearly half of the N and P of their slaughter pigs feed. Farm A's sow feed is also lower in N than its slaughter feed, but is about the same for P.

## **Discussion**

### *Sows*

Farm B's sows likely do not have enough bodyfat due to insufficient feeding levels, which has resulted in the lowest weaned pigs per sow per year, the lowest weaning weight, and the second lowest farrowing percent leading to the highest non-productive days per litter. Conversely, Farm F is comparatively overfeeding their sows. Farm C had the highest piglet mortality rate for both 2015 and 2016, which indicates a systemic problem causing disease, high number of stillborn, starvation, or high occurrence of crushing deaths. Either way, Farm C needs to reevaluate its management of sows and piglets during the lactation period.

### *Slaughter pigs*

Between 2015 and 2016, Farm F's slaughter pig mortality nearly doubled from 2.3% to 4%. This increase is likely related to the drastic increase in pleurisy and serositis, SL289, from 5.4% to 28.5%. This outbreak also caused a decrease in daily gain, and a subsequent increase in feed per gain ratio. Farm B appears to have suffered from a similar outbreak, yielding similar production stats to Farm F. Farm E had an even larger outbreak of pleurisy and serositis in 2016 with 59.1% of slaughter pigs affected, leading to an 8% death rate and a similar daily gain. Looking at the production stats, it is likely Farm C also had a disease problem, as Farm C had the highest death rate and lowest daily gain. However, there is no indication of what the problem may have been from the limited data collected. Production data on Farms B, C, and E from previous and subsequent years would be helpful to determine if this disease level is "normal" due to management and herd blindness, or if was a one-off outbreak seen in Farm E. Unlike the other 4 farms, Farm A did not appear to have any major disease issues from the data presented and appears to represent what the production statistics should look like in a healthy Danish organic pig herd.

### *Feed and manure*

For farmers wanting to reduce their N or P concentrations in manure to allow more spread per hectare, focus should be on reformulating the sow diet. More specifically, focus should be on reformulating diets when sows are in untethered housing, as this segment produces significantly more manure than slaughter pigs and piglets combined. But reducing N or P concentration in the feed will not have the desired effect if the farmer is overfeeding or increasing the feed per day simultaneously. While Farm E has less N and P per kg. of feed, Farm E has more N and P in the manure than Farm A. This is because Farm E is overfeeding its sows, which is likely more expensive than to feed a slightly higher quality feed, but at a lower quantity. However, Farm E has higher N and P in the slaughter pig feed compared to Farm A, but has a lower N and P in the manure. The data is very close and this inconsistency could be due to a measurement error.

### *Comparison across Europe*

Several studies were done in 2015 examining swine production data across Europe. However, these studies did not distinguish between organic and conventional, but merely calculated an average of participating farms for each country. Therefore, some of the data collected in this paper will naturally be higher than the data in these studies, due to limitations of organic production. For example, in pig mortality during rearing and finishing

phases, Figure 7 shows that Denmark is the 3<sup>rd</sup> and 2<sup>nd</sup> highest respectively. While the finishing mortality found in this paper was only about 1-2% higher, the rearing mortality is about 7 times higher. This massive difference is partly due to factors such as crushing, predation, parasites, and weather conditions which have a stronger effect in organic than in conventional swine production. This large difference could also be due to the paper's definition/calculation of rearing mortality. Postma *et al.* (2015) compared mortality until weaning in Belgium, France, Germany, and Sweden that had a range of 12.5 - 19.8%. While this is still lower than the data found in this paper, it is only about 5.5% lower. Even so, the finishing mortality rate found in this paper is still way off from where it should be, and must be a point of focus for Danish organic farmers.

Another point of focus in organic pig production is to reduce the number of piglets per sow. Denmark has the most pigs weaned per sow per year with an average of 31.3, and with an average of 2.3 litters per sow per year, this means that more piglets are born per litter than a sow has teats (AHDB). However, the farmers in this paper have managed about 20-23 piglets per sow per year, which is more appropriate and is in line with several other countries.

For slaughter pigs, the feed conversion ratio is about 0.5 feed per gain higher than the National and European average (AHDB). This is within reason considering organic pigs have a higher maintenance requirement, and amino acids cannot be supplemented in the feed.

While there is some organic production data available across the EU, the data is too inconsistent. Thus, not enough could be compiled to compare it to the data presented in this paper. Also, the definitions of organic production changed drastically from country to country. For example, organic production in Germany was almost exclusively an indoor operation, making the data not comparable to the outdoor production in Denmark. As such, a compilation and comparison of production data in various EU countries is needed, to gauge how an individual country is doing comparatively. Subsequently there is also a need for more definition of organic production, or it should be divided into indoor and outdoor organic production, when comparing relevant data.

## **Conclusion**

Overall, there are several areas Danish organic swine farmers must focus on to improve their production. Better management of N and P through feeding to reduce the levels in the manure and to reduce waste. This can be done through reducing N and P in the feed and the quantity of feed given per animal. However, too much reduction in feed quantity may result in poor body condition, which would reduce the yield on slaughter pigs, and reduce sow production for current and subsequent parities. Management focus on disease control and prevention is also needed as only 1 of the 5 farms appeared to be healthy. Disease has the highest economic effect, as it reduces the animal's gain and efficiency, which results in a high % loss. However, farmers maybe blind to how prevalent disease is in their herd and how much this is affecting their bottom line. Therefore, it is important to share production data and compare with others, within Denmark and across the EU to benchmark good results.

## **Perspectives**

Having more data points would have reduced the variation seen in this data due to management differences and disease outbreaks. Danish farmers need an average or standard they can compare their data to, so they can gage how their herd is doing and reduce herd blindness.

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