EU PiG

EU PiG Innovation Group

Technical Report

Meat Quality

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727933.

Challenge: Replacing GM Soy for Feed Production

Introduction

In this technical report an overview is provided of best practices that are successfully applied in pig farms in Europe. Pig farmers and farm advisors can use this report to learn more about how the best practices have been implemented on the farms and what challenges these practices are able to tackle. This third-year report on the theme “Meat Quality” treats the following two challenges:

- Replacing Genetically Modified (GM) soybean for feed production;
- Opening farm to engage with public.

1. The Background of the Challenge

In the last two decades consumers concerns about the use of GM food have grown considerably. According to a study conducted in four European countries, products with a ‘free-from label’ were considered healthier than products without such a label, with the strongest effects occurring for labels indicating that products were free of genetically modified organisms (GMOs) (Hartmann et.al., 2018). Another earlier study concludes that consumer attitudes towards GM in food production are negative and that these negative attitudes guide the perception of food products involving the use of GM (Grunert et.al, 2003). Unlike the fact that transfer of specific GMO-related DNA or protein from consumed feed to the animal has seldom been observed (Nadal et.al, 2018), many consumers mistrust pork produced with pigs to which GM soy has been administered. This poses the question for pig farmers in Europe to find alternative feed proteins able to replace GM soy in the diet. A major issue for pig farmers is to avoid a strong increase of production costs, since non-GM soy-based compound feed is expensive (Erikkson M. et.al, 2018) with respect to GM soy. This means that pig farmers are looking for alternative protein crops able to replace GM soy in the pig diet. An example of an innovative approach is the use of proteins of micro-algae and insects: these seem to be able to replace soy without compromising pork quality (Altmann et.al, 2019). Obviously, a lot will depend on the availability of these protein sources for pig farmers. The cost-effective production and use of microalgae is a major challenge for the near future (Madeira et.al., 2017).

2. Addressing the Challenge

There are many alternative sources of protein that may replace soybean meal in the pig diet, but not all are suitable to be included in the pig diet. The problem of canola, cottonseed and sunflower meal is that their digestibility is lower than soybean meal, because of their higher fibre content. Sunflower meal and canola meals, therefore, should be significantly less expensive than soybean meal to be an economical alternative, because of their lower concentration and digestibility of amino acids and lower content of energy compared to soybean meal (Stein, 2019). Moreover, the advantage of soybean meal over other protein sources is the very good amino acid balance, as it contains lysine, tryptophane, threonine and isoleucine (Florou-Paneri et.al.,2014). When using broad beans to replace soybean meal we need to be aware that broad beans are richer in lysine, but contain less methionine, cysteine, threonine and tryptophane. This unbalanced dietary amino acid supply may reduce the growth performance of growing pigs fed with diets high in broad beans (Partanen & Siljander-Rasi, 2003). In contrast, another research concerning faba beans has shown that their inclusion in the diet resulted in similar finisher performance compared to soybean meal and there were no effects on carcass quality. It is concluded that pea and faba bean may be a viable alternative to soybean meal in grower and finisher pig diets (Smith et.al. 2013). Other previous studies confirm this conclusion, but also stress the point that a diet with pea and faba beans should be supplemented with crystalline methionine or tryptophane to correct for this deficiency (Gatel & Grosjan, 1990). Also according to Degola (2018) there is an effect of inclusion of peas or faba beans on pigs average daily gain in the finishing period when the diets are integrated with crystalline amino acids (Degola, 2018).

3. EU PiG Best Practice

In order to identify the top five best practices across all the EU PiG regions, a series of criteria, aiming at measuring the effectiveness of the collected practices to match the specific challenge, were defined.

The following set of criteria will be scored for each practice.

- **Excellence/Technical Quality**
  - Clarity of the practice being proposed;
  - Soundness of the concept;
  - Knowledge exchange potential form the proposed practice;
  - Scientific and/or technical evidence supporting the proposed practice.

- **Impact**
  - The extent to which the practice addresses the challenges pointed out by the Regional Pig Innovation Groups (RPIGs);
  - Clear/obvious benefits/relevance to the industry;

- Impact on cost of production on farm and/or provide added value to the farming business or economy;
- The extent to which the proposed practice would result in enhanced technical expertise within the industry e.g. commercial exploitation, generation of new skills and/or attracting new entrants into the industry.

- **Exploitation/Probability of Success**
  - The relevance of the practice to each Member State (MS) or pig producing region/system;
  - Timeframes for uptake and realisation of benefits from implementation of the proposed practice are reasonable;
  - Level of innovation according to the Technology Readiness Level (TRL);
  - The extent to which there are clear opportunities for the industry to implement the practice/innovation;
  - Degree of development/adaptation of the practice to production systems of more than one MS.

Scores must be in the range 0-5 (to the nearest full number). When an evaluator identifies significant shortcomings, he or she must reflect this by awarding a lower score for the criterion concerned. The guidelines for scoring are below (no half scores should be used).

0	The practice cannot be assessed due to missing or incomplete information.
1 - Poor	The practice is inadequately described, or there are serious inherent weaknesses.
2 - Fair	The practice broadly addresses the criterion, but there are significant weaknesses.
3 - Good	The practice addresses the criterion well, but a number of shortcomings are present.
4 – Very Good	The practice addresses the criterion very well, but a small number of shortcomings are present.
5 – Excellent	The practice successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

The selection of the top five best practices followed the procedure described below:

1. Members of the thematic group (TG) were asked to score all submitted best practices according to the defined guidelines and sent their scoring sheets to the TG leader
2. In addition to the scores, TG members provided brief comments indicating weak points or particular strengths of submitted best practices
3. A conference call was used to discuss the scoring results and select the top 5 best practices. During this call, the top 10 best practices were discussed based on the ranking

submitted by thematic group members. The discussion of the top ranked best practices was started from the lowest rank, i.e. best practice with the highest average score, to rank number 10. A selection of the top 5 best practices was made during the call.

4. A summary of all discussions was sent out after the call to review the decision of the selected five best practices by TG members.

4. Results and Discussion

4.1. Validation of the Top Five Best Practices

The following top 5 best practices within the challenge of 'Replacing GM soy for feed production' have been selected by the thematic group:

Title of Best Practice	**Country**
Locally Grown Protein Can Replace Soy in Pig Feed	Finland
No Soy Starter Feed: NOVALIA	
Replacing GMO Soya in Feed	Poland
GMO-free Pig Supply Chain	Italy
GMO-free Feeding in HAGE Kaba Farm	Hungarian

Locally Grown Protein Can Replace Soy in Pig Feed

Faba bean (Vicia faba) was added in the crop rotation. Faba bean cultivation improves the growth of grains, and cultivation cost of beans is low. Earlier barley, wheat, oatmeal, faba bean, liquid barley protein (a by-product of barley starch production from Altia Koskenkorva distillery) and an additional protein concentrate were used in the two-stage feeding of fattening pigs. Due to the ingredient basis with high protein content of the crops, the utilization of the faba bean was low. To increase the usage of local grown protein in pig feed, we developed a tailored premix together with a local feed company (Rehux) and HKScan in 2017. In the beginning the viscosity of the premix was too low due to the amount of oil and the accuracy of dosing of small volumes was poor. The accuracy of dosing was improved by turning off the mixer while dosing the premix. The farmer has to invest in a new mineral dispenser and its conveyors. Faba beans are now grown on a larger area (+150 %) which is also more sensible in the crop rotation. The amount of faba bean in feeding could be increased (+ 200 %). The farm self-sufficiency rate of feedstuffs was increased (7 % if calculated of energy content). Production values in 2016 vs. 2018: Feed conversion ratio

2,7 vs. 2,6 Daily weight gain 960 vs. 1050 g/day Lean-% has remained constant, around 59 %. However the pig genetics play a more significant role than feeding. Other advantages of this practice for pig farmers are the increased farm self-sufficiency rate in protein feedstuff and the improved crop rotation.

No Soy Starter Feed: NOVALIA

This feed is the first piglet feed on the market without soybean meal. It aims at improving the digestive comfort of piglets and adaptation to the particular context of weaning. Cereals, which are the major constituent, undergo a thermal treatment: extrusion, flaking to promote their digestibility. Protein levels are adapted to the very variable breeding conditions observed in the field. The sources are diversified: peas, potatoes and dairy proteins, favouring national supply. The removal of soybean meal significantly reduces allergenic aspects and promotes immunity. The chicory pulp, prebiotic, allows an oriented development of the intestinal flora and thus a better feed valorization. The Novalia feed was created by the Nutrition Service of the Triskalia pork group. A consequent improvement of the animal health is expected and potentially able to decrease the use of antibiotic and zinc-oxide in the diet of post-weaned pigs.

Replacing GM Soy in Feed

Replacing GM soy in feed. The farmer is not using GM soy at all. He replaced it with rape meal (up to 6%) and fish flour as well as with papillonaceus plants: blue lupine (up to 10%) and peas (up to 10%) that he grows on his fields. In order to improve digestion of papillonaceus he also adds effective microorganisms (EM bokashi probiotic) to the feed. It is a much cheaper feed. He is able to produce enough papillonaceus plants to feed pigs for 8 months a year. To improve the taste of the feed he adds dried alfalfa up to 4%. This diet is cheaper than the diet based on soy especially when the farmer is able to produce the plants on his own fields. It takes some time to settle the right proportion in feed and requires additional ingredients to improve the taste of the feed like dried fruits or dried alfalfa and probiotics to reduce the gases that paillonaceus plants origin during the digestion process.

GMO-free Pig Supply Chain

The pig farm runs 3 fattening units to keep 7.500 pigs up to 165 kg of live weight. Growers 35 kg heavy origin from a breeding farm where weaners are GMO-free fed. Sows and gilts are not fed GMO-free. GMO-free feed is given to the piglets starting from the lactating phase (i.e. creep feed) and prolonged in the next weaning phase. Provision of raw and/or integrated or premixed concentrated feed must origin from endorsed farms, certified by the CSQA certification body. Animal meals are forbidden. Feed composition complies with the rules of Parma ham and San Daniele ham production schemes. Vehicles for feed transport are used for GMO-free feed only to avoid contamination with GM materials. Before starting new GMO-free pig production a transition time 4 months long is required after all silos of the farm are cleaned up and washed; afterwards the first production cycle of GMO-free fed pigs can start.

The cost for a grower 35 kg heavy and GMO-free fed is higher (4,55 €/head) due to the higher feed cost (0,13 €/kg). Considering an average difference of 40 €/t for non-GM soy (from 20 to 80 €/t), a feed consumption of 470 kg/pig (from 35 up to 165 kg of live weight) with 15% soy meal content on average, a higher feeding cost of 2,82 €/head is calculated. Benefit for a pig GMO-free fed is a reward of 0,06€/kg at slaughter which means 9,9 €/pig at 165 kg of liveweight. The positive return for the pig farmer is 2,8 €/pig on average; however it can vary from -0,29 up to 3,94 €/slaughter pig, according to the variation of the difference between prices of GM and non-GM soy meals. This best practice can have some transnational impact as it is an example of pig alternative supply chain matching with consumer's demand for GMO-free food, mediated by large retailers.

GMO-free Feeding in HAGE Kaba Farm

The farm feeds pigs with GMO free feeding in the whole rearing period. Hungarian companies are looking for alternatives. This innovation is likely to become a growing niche market as there is a demand for non-GMO fed pork. We wanted to analyse the extra costs involved. GMO-free soybean is expensive and not available in larger quantities, so the soy had to be replaced with other protein carriers. This was primarily done by using Sunpro 46, is a fiber-reduced sunflower. The first test lasted 4 months. In the first phase rapeseed has been used as Sunpro was not available yet. Because of the high protein content, the feed became more expensive. The second phase was a bit cheaper, while the price of the third phase remained unchanged. Less dependence from importing GM soy. The farmer learned that he has to be careful with the rape seed and to use it only to a limited extent. Everyone has to evaluate how much it costs for a given technology and breed. The innovation process is still ongoing. Preliminary figures: weight gain was 4,6% worse; cost per 100 kg of production was higher by nearly 1,5 €. Non-GMO fed pigs have much better market price, especially in the Asian market. In the global market non-GMO fed pork price can be 1,3-1,5 €/kg higher than GMO fed pork price.

4.2. Cost and Benefit Analysis of the EU PiG Ambassador

Cost and Benefits of Locally Grown Protein Can Replace Soy in Pig Feed

On a pig farm in Finland, faba bean (Vicia faba) was added in the crop rotation. Faba bean cultivation improves the growth of grains, and the cultivation cost of beans is low. Earlier barley, wheat, oatmeal, faba bean, liquid barley protein (a by-product of barley starch production from Altia Koskenkorva distillery) and an additional protein concentrate were used in the two-stage feeding of fattening pigs. Due to the ingredient basis with high protein content of the crops the utilization of the faba bean was low. To increase the usage of locally grown protein in pig feed, a tailored premix has been developed together with a local feed company (Rehux) and HKScan in 2017. Faba beans are now grown on a larger area (+150 %) which is also more sensible in the crop rotation. The amount of faba bean in feeding has

increased by 200 %. The farm self-sufficiency rate of feedstuffs was increased by 7 %, if calculated on the basis of the energy content. Feed conversion ratio improved from 2,7 to 2,6 and the Average Daily Growth from 960 to 1.050 g/day, whereas the percentage of lean meat remained constant at around 59 %. The difference in feed cost is 5 € for the diets used on Harjunmaan Tila (locally produced faba beans and premix), compared to diet with commonly concentrate, which contains soybean meal. This means 1,10 € saving per pig in feed cost.

Based on these assumptions, the production costs of pig meat produced with alternative protein feed, compared to feed containing soybean meal, can be calculated by using the Interpig model for Finland.

Table 2 - Production costs of pig meat with two different feed diets

	With soybean meal	Alternative protein feed	% change
Feed, (€/kg cold weight)	0,78	0,76	-2,42
Other variable costs, (€/kg cold weight)	0,37	0,37	-0,21
Labour, (€/kg cold weight)	0,17	0,17	0,00
Finance cost, (€/kg cold weight)	0,32	0,31	-3,17
Total costs (€/kg cold weight)	1,65	1,62	-1,81

Due to the better feed conversion rate and the higher average daily growth, the production cost of pig meat with GMO-free feed is 1,8% lower compared to the production cost of pig meat with diets that contain GM soy meal. The feed costs decline by 2,4% and the finance costs go down by 3,2% because of lower interest costs on financial capital. It should be stressed, that the assumption is that the alternative feed is produced with contract labour and that the pig farmer is paying a price for the alternative feed that covers entirely the production costs of the feed production.

4.3. Expert Analysis

The experts of the Meat Quality Thematic Group agree with the results of the cost-benefit analysis applied to the best practice of the EUPIG Ambassador. The potential cost and benefits can move within a certain range due to the fact that the average daily growth related to the optimisation of the administration of feed to the pigs may vary from farm to farm. Also the labour input may differ between farms as these costs are related to the size of the pig farm.

4.4. Conclusions and Advice to Industry

Key elements for the implementation of the practice:

- Alternative protein crops such as faba bean, blue lupine, peas, rape seed and fiber-reduced sunflower (i.e. Sunpro 46) can replace GM soy in fattening pig diets and even in weaned pig diets;

- The lack of essential amino acids in protein sources, as alternative to soy, should be compensated by adding crystalline amino acids to achieve a balanced diet without compromising pig growth performance.
- Digestibility of diets including faba bean, blue lupine and peas can be improved by adding prebiotics (e.g. chicory pulp) and/or probiotics (e.g. EM bokashi);
- Palatability of alternative diets can also be improved through additives such as dry alfalfa (up to 4%) and/or dry fruits;
- The more expensive production of pigs fed with non-GM soy can be compensated by the higher market price of pork originated from GMO-free fed pigs.

The replacement of soy in the pig diet may result in a lower production cost if alternative protein crops, such faba bean are self-produced on the farm and carefully used in well balanced diets for pigs. Extra costs for feeding pigs with GMO-free soy may be covered by higher pork prices in countries and regions where consumers are willing to pay more for pork originated from GMO-free fed pigs.

5. The Future

European pig farmers are interested in finding alternative feed proteins able to replace GM soy in the pig diets as a result of the increased concerns of consumers about GM food in the last two decades. Pig farms with enough arable land can increase their self-sufficiency of protein crops by integrating the crop rotation with more protein crops (non-GM soy, faba bean, peas, sunflower). The cost-effectiveness of using protein crops, as alternative sources to soy, depends on their production cost, compared to the soy meal price, to the additional costs for an amino acidic well-balanced diet and finally to the market price of pork origined from GMO-free fed pigs.

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Challenge: Opening Farm to Engage with Public

Introduction

In this technical report, an overview is provided of best practices that are successfully applied in pig farms in Europe to increase the trust of consumers towards pig farming and the consumption of pig meat. Examples are given here of “Opening farm to engage with public”. Pig farmers and farm advisors can use this report to learn more about how the best practices have been implemented on the farms and what challenges these practices are able to tackle.

1. The Background to the Challenge

Food supply chains are increasingly complex and dynamic due to (i) increasing product proliferation to serve ever diversifying and globalising markets as a form of mass customisation with resulting global flows of raw materials, ingredients and products, and (ii) the need to satisfy changing and variable consumer and governmental demands with respect to food safety, animal welfare, and environmental impact (Trienekens et al. 2012).

Consumers generally have limited knowledge about basic pork production and safety issues and consequently have difficulties with distinguishing between different labels of fresh or processed pork products. Nowadays, consumers base their buying decisions on their personal perceptions of value, resulting from a balance between price and quality and differences in social, cultural, and educational status. The lack of knowledge about livestock production practices and their impact on animal welfare and meat quality also explains the poor consciousness in large part of meat consumers worldwide. The numerous initiatives of the food supply chain in response to the consumer requirements for improved animal welfare are having the most visible influence on their purchase behaviour (Faucitano et al. 2017).

Young adults in developed countries are distanced from agriculture and the meat industry needs to do a better job of communicating with them. Retailers are major drivers of animal welfare standards enforcement and respond to pressure from both activists and consumers (Grandin, 2014). Concerns for the ethical treatment and rights of animals, the impact of livestock production on the environment, and the role of animal foods in human health have been debated by the public (MacDonald and Reitmeier, 2017). The relative importance of production characteristics are likely to vary between consumer segments and cultural differences amongst these segments or countries. For example, traditionally, it has been said that Northern European countries gave more importance to attributes such as animal welfare or environmental impact, whereas in the Mediterranean areas meat quality was

more appreciated. According to a recent study in Germany and Poland, the production characteristics that consumers perceive to be the most important relate to health and safety aspects rather than animal welfare and environmental impact (Grunert et al., 2018).

In the ongoing public debate about livestock production systems, especially for pig production, natural living conditions, including sufficient space for each individual animal, outdoor access and litter bedding are the most discussed public issues. In contrast, many consumers are very price sensitive and additionally, demand that products have high food safety and high quality (Sonntag et al. 2019).

2. Addressing the Challenge

Chain actors believe that consumers should be adequately educated about animal welfare and be informed that intensive farming *per se* does not necessarily mean and imply animal non-wellbeing, paying attention to avoid incorrect or inadequate information that could create negative effects on the market. There is a need for commonly agreed definitions of animal welfare and production systems with participation of all stakeholders in the food chain, to avoid emotional, ill-informed and inaccurate descriptions by some organisations in the media (Spoolder et al. 2011).

Activists and academics are increasingly advocating for public procurement of locally grown food as a key market opportunity for farmers. In the United States, linking farmers directly with school cafeterias through farm to school programs are among the efforts that advocates say can provide a significant boost to rural economies; in this country a study showed that farmers sold their products to schools for two primary reasons: to diversify their marketing strategies and to contribute to social benefits through direct action (Izumi et al. 2010). In this context pig farms equipped and organized to host students, citizens and consumers to show them how pig farming is performed are welcome as they are likely to increase consumer's trust and demand for pig meat. Nevertheless, the risk of introducing pig diseases in the pig farm through the visiting people is very high if very strict end effective biosecurity measures are not in place. For this reason, closed circuit TV is recommended to show pig farming practices remotely from a visiting room on the farm or from a classroom at school/university without any risk of disease transmission. Regardless, hosting visitors on the farm can be a way to promote direct sale of fresh meat and cured meats in companies that process meat and have a farm shop.

3. EU PiG Best Practice

In order to identify the top five best practices across all the EU PiG regions, a series of criteria, aiming at measuring the effectiveness of the collected practices to match the specific challenge, were defined.
The following set of criteria will be scored for each practice.

- **Excellence/Technical Quality**
    - Clarity of the practice being proposed;
    - Soundness of the concept;
    - Knowledge exchange potential form the proposed practice;
    - Scientific and/or technical evidence supporting the proposed practice.

- **Impact**
    - The extent to which the practice addresses the challenges pointed out by the Regional Pig Innovation Groups (RPIGs);
    - Clear/obvious benefits/relevance to the industry;
    - Impact on cost of production on farm and/or provide added value to the farming business or economy;
    - The extent to which the proposed practice would result in enhanced technical expertise within the industry e.g. commercial exploitation, generation of new skills and/or attracting new entrants in to the industry.

- **Exploitation/Probability of Success**
    - The relevance of the practice to each Member State (MS) or pig producing region/system;
    - Timeframes for uptake and realisation of benefits from implementation of the proposed practice are reasonable;
    - Level of innovation according to the Technology Readiness Level (TRL);
    - The extent to which there are clear opportunities for the industry to implement the practice/innovation;
    - Degree of development/adaptation of the practice to production systems of more than one MS.

Scores must be in the range 0-5 (to the nearest full number). When an evaluator identifies significant shortcomings, he or she must reflect this by awarding a lower score for the criterion concerned. The guidelines for scoring is below (no half scores should be used).

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5 - Excellent	The practice successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

The selection of the top five best practices followed the procedure described below:

1. Members of the thematic group (TG) were asked to score all submitted best practices according to the defined guidelines and sent their scoring sheets to the TG leader
2. In addition to the scores, TG members provided brief comments indicating weak points or particular strengths of submitted best practices
3. A conference call was used to discuss the scoring results and select the top 5 best practices. During this call, the top 10 best practices were discussed based on the ranking submitted by thematic group members. The discussion of the top ranked best practices was started from the lowest rank, i.e. best practice with the highest average score, to rank number 10. A selection of the top 5 best practices was made during the call.
4. A summary of all discussions was sent out after the call to review the decision of the selected five best practices by TG members.

4. Results and Discussion

4.1. Validation of the Top Five Best Practices

The following top 5 best practices within the challenge of 'Opening Farm to Engage with Public' have been selected by the thematic group:

Title of best practice	**Country**
Community Manager for Pigs!	Ireland
Visiting-farm for Schools	Denmark
Open Farm	Spain
'SowBook' – A Facebook Page to Follow a Sow Career	France
Improving the Public's Opinion by Organising Piglet Cuddling	The Netherlands

Community Manager for Pigs!

With a lot of negative ill-informed information about pig production, the challenge is how to better inform the consumer and general public. McAuliffes have opened their farms with a

passion to inform consumers about sustainable pig production. They have featured on many national tv programmes (including a live broadcast from the farm on “Big Week On The Farm”, watched by 1.5million viewers!). They have an open door policy; at the same time they adopt very strict biosecurity measures including a viewing room where large groups can look at the pigs and watch CCTV footage on the big tv screen from all over the farm. Shane spends a lot of time giving guest lectures at third level institutions, using videos to give them an interactive tour of the farm, and they also host student placements on the farms. He has a strong presence on social media with almost 10.000 followers across different social media platforms (Facebook, Twitter, Snapchat, Instagram, Linkedin). The main benefits are to the whole pig farming sector as it gives them a reasoned voice in an era of much negative press towards farming in general and sometimes pig farming in particular. The consumer and general public also benefit from hearing from the farmer perspective, something not always very evident or accessible. This approach has evolved over time. Costs are minimal, but it takes a lot of time, which Shane is willing to devote as he is committed to giving a farmer perspective on sustainable pig production.

Visiting-farm for Schools

Participate in “Visiting-farms” for schools: school classes can visit a farm and learn about pig/cattle production. Farmers can sign up to the programme voluntarily. The concept is arranged by Danish Agriculture & Food Council. The webpage is (in Danish): https://skole.lf.dk/. The programme has 23.000 visitors to the farms yearly. Normally the visitors (teacher) makes a call to the farmer, then they book the visit on the webpage (https://skole.lf.dk/). In this case about three classes (4,5,6 grades of school classes) visit the farm yearly (and often from same school/teacher). In addition, older students can visit the farm on an internship. The visit takes about two hours during which students learn about biosecurity, facts about the production and touch the animals. They get tasks to solve when they go to the pig unit either by group discussion or by asking the staff in the pig unit. Often the visitors eat their lunch while watching tractors, harvester and provide positive feedback to the farmer. Some of the visitors (older children) have asked for a job after the visit. Danish Agriculture & Food Council pay 67 € to the farmer for each visit. It is important that children can touch the animals and a tip is to start in the farrowing unit. The tasks they have to solve have to be carried out orally (difficult to write down and touch animals etc.). Some children don´t want to get into the pig unit because of the smell etc. Guided tours at the farm are offered at the farm, advertised on Facebook and local newspapers and communicated to schools. The cost for boots and clothes is paid by the Danish Agriculture & Food Council. It is necessary to have boots and clothes for about 20-30 persons (in different sizes). Both clothes and boots can be reused.

Open Farm

The farmer opens his farm to visitors, specially families, because he believes that he may simply enhance people trust by seeing its activity. He alerts people about necessary

biosecurity measures. Visits are offered to both families or schools. The visit takes about 1 hour and 30 minutes, including a video of farm activities and history and a physical visit to the different stages of the production process (sow and piglets and fattening). The visit also includes a tasting session of own branch of cured products (“Embotits Salgot”). There is a picnic area just 5 minutes walk from the farm and people can stay to enjoy the beautiful scenery, after visiting the farm shop. The farm visit is advertised on Trip Advisor. People do pay a fee for the visit (10 euros adults and free for children) which covers part the labour costs of the contracted people needed to run the visits. Opening the farm helps to promote the sale of farm products, although it is hard to exactly estimate the percentage of increase in sales, but the farmer believes that diversification helps the family business. Strategies to open farms can be easily tailored to different production systems, especially those of a familiar dimension where it is possible to control biosecurity and traceability.

“SowBook” – A Facebook Page to Follow a Sow Career

The farmer was used to open his farm to public once a year. He then decided to create a Facebook page to follow the everyday life of one particular animal (i.e. a sow from its birth) in order to guarantee biosecurity and to provide a dynamic view of the farm. Through this initiative, the farmer tackles technical points with his followers over the successive period of the sow’s life (the first days of the little piglet sow; the care during the lactation period; tail docking; the starter; the fattening period; the vaccination; Reproduction, showing insemination and ultrasound scan; Feeding and nutrition in relation to growth performance; Genetic selection) while paying attention to popularizing the vocabulary in order to make comprehensible for the public these technical subjects. These different conversations on Facebook are an opportunity to reveal the reality of practices in full transparency, without trying to embellish the situation, but explaining the reasons for each practice by using a smartphone for photos and videos. The farmer makes an effort to publish a post per week, in order to keep the thread of discussions and maintain the interest of followers. No profit or financial benefit is expected through this process, even if the farmer has a shop on the farm. No commercial messages are present on this profile. The only goal is transparent communication on the farmer's job. 970 subscribers follow this publication. In addition, some posts are shared by other followers, and the profile is also relayed by another Facebook page (Agriculteur de Bretagne) whose objective is also to convey positive messages of agriculture. Finally, this approach allows ""to open farms to the general public"" without physically moving visitors inside the facilities, and thus without compromising external biosecurity. This initiative - which uses a global social network - can be immediately picked up and shared by breeders in all EUPIG countries participating in the EUPIG GrandPrix.

Improving the Public's Opinion by Organising Piglet Cuddling

In 2012 they developed a new vision with a mind-set towards the consumer. Animal welfare is nevertheless an important theme for consumers, so they continued on that. This ultimately led to the realization of 'Piggy's Palace', a small business set-up with 150 meat pigs living

outside. Experiments were done with different types of food (herbs, mustard, acorns). These pigs are not castrated, live with curled tail and are completely antibiotic-free. The pigs can literally go through the slide into the mud and shelter in the haystack. Erik organises piglet cuddling days where people can come in contact with the pigs. They can cuddle with the small piglets. This releases oxytocin (the cuddling hormone) which makes people happier. In this way people can come in contact with the sector. Piggy's Palace is a forerunner of the sector. It has an example function which other companies can learn from. Although it is hard to change instantly. This is a process that needs to be executed at a slow pace. The costs that are made to realise the innovations are around 40.000 €. The meat is sold via their own brand PiPaPorc at local butchers and restaurants. In the summer many tourists and locals visit the farm and buy the product at farm. Also workshops are given to involve citizens in pig farming. Next to the location in Bathmen Stegink owns an organic pig farm in Raalte and porking farm in Germany. He is active in the regular and social media. For example he was interviewed on national television because he produced the first cheese made of pig milk. He always shows that pigs are fun, but with a serious message. The company is built on multiple pillars. This results in a good running business which is an example for other pig farmers.

Back to the Start: The current pig farming industry is getting resistance from different groups of people. At many pig farms, scale increases take place to produce high-quality pork as efficiently as possible and at the lowest possible cost. However, citizens lack support for the current way of keeping pigs. The citizen is disturbed by the large stables in the landscape. Moreover, citizens often have the impression that welfare and animal health leave something to be desired. Switching to an animal-friendly concept such as Piggy's palace can be applied anywhere in the world; for instance visitors from various cultures (i.e. UK, Korea) were hosted and get ideas for their own farms. On the other hand, Erik also visits farmers around the world to get and share knowledge and experiences within the Nuffield Scholar.

4.2. Cost and Benefit Analysis of the EU PiG Ambassador

Costs and Benefits of Community Manager for Pigs!

A real and precise cost and benefit analysis cannot be performed for these best practices and for the EU PiG Ambassador "Community Manager for Pigs!". As hosting visitors is not pig farming, this activity cannot be included in the production process to assess its cost and benefits economically. Indeed the main objective of this practice is to increase, generally, the trust and loyalty of consumers towards pig farming and pig meat whereas, in other cases (i.e. best practice "Open farm") another objective can be the direct sale of farm products (i.e. fresh and processed meat) on the farm. Anyhow, some figures have been collected from the EU PiG Ambassador to understand the cost and/or workload for the farm to run this best practice. The farm was built on a greenfield site in 2009 and so the "viewing area" for visitors was originally incorporated into the design of the farm. It is a 1000 sow integrated unit.

Visitors don't have to pay any fee for this service as the farmer is in the opinion that it is very important for him to be open, honest and transparent with the general public and the agricultural industry. As regards to the number of visitors per year the farmer says that he is not hosting as many visitors as before due to the recent threat of African Swine Fever. Instead he is visiting more and more universities and gives them a presentation, with an interactive tour by using videos. The farmer didn't receive any subsidy to carry out the investments related to the visitors viewing room. As regards to the workload to host the visitors the farmer estimates one day per month.

4.3. Expert Analysis

The experts of the Thematic Group Meat Quality agree with the need of the pig industry, specially the intensive one, to gain trust of consumers by educating on how pigs are produced and its implications. Opening the farms, when caring for biosecurity aspects, is a proper tool to enhance trust and support consumers' choices. The practice that was selected as Ambassador meets the criteria of being innovative and farmer managed, proactive in raising societal awareness of the pig sector.

4.4. Conclusions and Advice to Industry

In this final paragraph we provide some advice on tips that the industry could use to enhance consumers' trust:

- Pig farms open to visitors should put in place strict biosecurity measures to limit the risk of introduction and diffusion of pig diseases.
- A centralized booking system may be effective to improve efficient planning and organisation of students' visits to pig farm visits;
- Cost of farm visits may be covered or cofounded by public subsidies;
- Open farm equipped with CCTV to offer guided tours to students and visitors may be an effective solution to provide fair information to citizens and consumers on farming practices in the pig sector without compromising farm biosecurity;
- Use of social networks and ICT can provide real information on how pigs are produced without being exposed to any biosecurity risk;
- Citizens and consumers should be communicated with clear and simple messages, based on objective data, pig behavior and farming options to produce under adequate management standards.

Analysis of cost and benefits of hosting visitors in pig farms is hardly feasible as this activity is not part of the production process; in farms provided with farm shops to sell their own produced pork cuts and processed products, the higher biosecurity risk related to farm visits can be compensated by increased consumers' loyalty and consequent larger sales on farm.

5. The Future

In general, the technological innovation of pig farms open for visits to student, citizens and consumers is to make use of the social networks and/or technological tools that will allow pig farmers to host visitors without any biosecurity risk. Farm equipped with CCTV and a meeting room to offer guided tours to students and visitors may be an effective solution to provide fair information to citizens and consumers on farming practices in the pig sector without compromising farm biosecurity. Communication should be as much clear and simple as possible, be oriented to different target groups, based on objective data and include pig behavior and farming options to produce pigs under adequate management standards.

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