

Editor: Amy Quinn

Welcome to June's Newsletter

Ciarán Carroll



Welcome to the June edition of our monthly newsletter. The long wait for a pig price rise continues, with many farms under pressure. Fluctuating prices in Europe aren't helping but the trend is upwards so hopefully the wait for a rise won't be too long more.

June has been another busy month for the Pig Development Department, with ongoing work and development in our discussion groups. We hope to start a new group in the North West very shortly.

The Teagasc ePM PigSys Herd Performance 2017 data has been completed, with notable increases in born alive (and reduced piglet mortality), numbers of pigs produced per sow per year, finisher sale weights and kg pig meat produced per sow per year. The report is going to print and will be circulated in the coming weeks. The annual InterPig and AgriBenchmark Group meeting takes place in Italy at the start of July

with over 40 experts from 19 countries due to attend, including Gerard McCutcheon representing Ireland. Our ePM PigSys data feeds into this group and will give us a comparison of production performance and costs across a range of EU and International pig production systems. The results from this group report will be published and circulated in the coming months.

Finally, development of our new Pig Managers Course continues. Interest has been great and the course is almost at capacity. Interviews will be held with applicants in July with the course commencing in September. If you haven't applied and still wish to do so, please contact us now to avoid disappointment.

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Future Ingredients for Irish Pig Diets

Edgar Garcia Manzanilla

The EU commission is concerned about the lack of alternative ingredients to soya for pig diets, especially with the expected increase in prices in future years. At the moment the EU depends mostly on the protein supplies from third countries because the production of soya in the EU is limited. Thus, EIP-AGRI as launched a focus group to study this issue. Teagasc researcher Edgar Garcia Manzanilla is part of the focus group and here is a summary of what was discussed in the first meeting.

There are literally hundreds of materials that could be used as feedstuffs for pigs directly or after some processing. However Ireland's geographic location makes it more challenging for Irish pig producers to avail of these alternative feedstuffs in comparison to continental Europe. Although all alternative products are of interest as long as they reduce the costs of production, the focus so far is mostly on protein sources. Thus, the main alternatives ingredients looked at are ingredients with moderate to high protein contents, good digestibility and amino acid profile and low levels of anti-nutritional factors, with a competitive price. Not many ingredients available in Ireland fulfil these requirements but we can discuss what other countries are looking at.

Industry residuals & former food

This is the category with the most available alternatives and probably the most realistic for the majority of countries including Ireland. The ingredients available vary by region but in general the technology can be extrapolated to some

extent. A good example can be seen from a Dutch company (FeedValid), a member of the focus group, that develops technologies to produce good quality feedstuffs from industry by-products.

(<http://www.feedvalid.eu/en/ingredients>).

Historically whey was the main product available in Ireland, but its use for human foods has limited its availability. Products such as bakery products, sweets, snacks or horticultural products may be available but these are mostly low in protein and rich in energy. Probably the best alternative at the moment in Ireland, with the increase of whiskey distilleries and the beer industry, are brewery products that have higher protein content. Many of these products are already used even if it is only regional but there is still great potential to refine the processes and increase use. A good Irish example of the products obtained from recycling can be found in the website of millstream animal feed <http://millstreamrecycling.ie/animal-feed/>.

Aquatic biomass & single cell protein (SCP)

Aquatic biomass includes a range of plant and micro and macro algae species, like duckweed, with high protein levels (50-60%), amino acid profiles similar to soyabean meal and interesting contents in omega 3 fatty acids and micronutrients. It may sound like a strange source of protein and its use in pigs has not been well studied yet but at the moment there are quite a few projects investigating these ingredients in the EU. The full scale development

is expected to take 5 to 10 years. There are ongoing projects in Ireland investigating and developing these products for farms also. The technical difficulties of these systems at the moment are that algae need heat in order to grow and a relatively constant supply of nutrients. The ideal situation would be to obtain the heat and nutrients from pig farms and thus recycle part of the energy and waste of the farm. Thus algae could provide a way to turn waste products into feed components.

In a similar way we can use bacteria or fungi to recycle waste products. Single cell protein (SCP) production can sound like a very technological process, and it actually is, but the concept is quite simple; from very different materials, you find a way to get nutrients that you feed to a bacteria or fungi population and they produce feed. The protein content of such products is very variable, ranging from 10 to 80% but they generally have good amino acid profiles. There were some efforts to develop similar products in the past like the product called Pruteen in the 80s but the results were not very successful. Hopefully the current advancements in technology improve the success of such products. Currently both Norway and Finland are working on systems using wood shavings to extract glucose, feed it to bacteria and produce SCP.

Insects

This one is an alternative ingredient that divides people; some are convinced that this is the food and feedstuff of the future and some think it will not be a major option. Those who believe it will be an important source of feed and food are investing significant amounts of time and money on it, such as Daniel Murta (<https://www.entogreen.org/>) who presented to

the focus group on the recycling plant that he has created in Portugal using insects. He also explained the huge interest that McDonalds have shown in insects as an alternative feed for animals. Among the most commonly used insects are Black Soldier Fly, Yellow Mealworm and Lesser Mealworm with protein contents of 40-60% and amino acid profiles comparable to soyabean meal. With these animals being very dependent on heat to grow it does not seem like a good alternative for Ireland but it may be available as an ingredient produced in warmer climates at some point.

The need to be proactive

Although there are Irish pig farmers using some of the ingredients mentioned, the formulation of pig diets in Ireland is mostly some sort of black box where the farmer outsources the process to a company and uses whatever ingredients are available. In general these are ingredients that are available in large amounts like soya, wheat or barley. There are opportunities for cost effective use of new ingredients in a more regional bases. However this use may require some research and development. This is something very common in some EU countries like the Netherlands or Germany and now the EU has made funding available to develop such initiatives in all EU countries through the rural development programs. These are the so called Operational Groups. You just need the idea, the right partners and a little bit of work, you can find some examples of such at the following link:

<https://ec.europa.eu/eip/agriculture/en/my-eip-agri/operational-groups>).

For more information on the EIP-AGRI group and updates follow the link:

<https://ec.europa.eu/eip/agriculture/en/focus-groups/new-feed-pigs-and-poultry>

Huge Potential for Digital & Visual Tools for Knowledge Transfer in the Pig Industry

Amy Quinn & John Moriarty

The use of visual and digital aids in agriculture, more specifically the pig sector, have the potential to enhance knowledge transfer and education. These types of tools might include video clips, factsheets, infographics or webinars that demonstrate skills training, research findings or topical information for example. Such knowledge transfer tools can ease learning experiences as they appeal to the senses of sight and sound and can enhance learning ability and information retention. Digital tools and platforms enable farmers to have instant access to a broad range of information in a user friendly, non-location dependant format at a time most suitable to their working routine that are compatible with multiple devices. More specifically for the pig sector, popular methods of communications such as on farm demonstrations, farms walks and open days are not generally a feasible method of knowledge transfer due to the potential threat to biosecurity. These tools can overcome this biosecurity issue. Additional benefits of such methods can also be seen from a Teagasc capacity as the use of such tools potentially provides communication methods that can be rapidly prepared or adapted and disseminated to a wide audience. It also provides consistency of information transmitted and can easily cater to multiple languages and learning abilities and topics.

DIGIPIG

A two year Teagasc project, DIGIPIG, aimed to determine the most suitable digital and visual

tools for use in the pig industry, along with the most suitable topics to be covered and the most appropriate delivery method of these tools to best assist the Teagasc Pig Development Department (PDD). Focus groups were carried out with three main demographics; 5 pig farm owner/manager groups, 3 farm staff groups and a Teagasc Specialist Advisor group. Discussion groups and pig production course participants formed the sample of farm owners/managers and farm staff. Participants in the groups proposed and discussed a number of visual and digital tools they thought would be suitable and beneficial for the pig industry and from this the most popular tools, content and delivery methods were determined. In total 17 different types tools were proposed and discussed by the groups. Of these the three most popular tool types were; video, infographics and factsheets. Of the 42 topics raised throughout the focus groups, the areas of farrowing and lactation, research work and husbandry skills were the most popular. Following on from this the most desired content was matched with the most suitable tool. The most the favoured delivery methods selected by the group for the tools included social media (Facebook and Twitter), the pig section of the Teagasc website and the Teagasc pig newsletter.

For evaluation purposes, a sample of five tools were developed, 2 videos on teeth grinding and an event promotion video, 2 factsheets on the value of colostrum and split suckling and an infographic on the national pig herd performance

figures for 2016 (Figure 1). These tools were evaluated for initial reaction to the design and content by administering a questionnaire to the same participants that the focus groups were conducted on. The tools were rated as “good” or “very good” by 98% of respondents, 98% would encourage colleagues or employees to refer to the tools and 99% felt the information was clearly delivered. A number of recommendations were made to improve the tools, such as 20% feeling the level of text in the factsheets should be reduced and the inclusion of space for own-farm performance on the herd performance infographic.

What next?

A general outcome from this study was the hugely positive responses from all groups for use of these tools in the pig sector. All groups sampled identified a benefit for themselves and their farms, and were in favour of their use going forward in the pig sector. With this in mind it is hoped that the outcome of the DIGIPIG project will be seen by producers in the coming weeks, months and years as the PDD intend to incorporate these findings into the knowledge transfer programme. In the immediate future the 2016 Herd Performance infographic, generated by the DIGIPIG project,

has been produced again this year as it was hugely popular on farms, this year it will incorporate the suggested improvements from the farmer survey. Farmers can expect to receive the 2017 Herd Performance infographic and accompanying booklet at the start of July. The DIGIPIG project also trialled factsheets with farmer and staff groups which were very well received and so the PDD intend to roll out a series of these factsheets covering all areas of pig husbandry, continually adding to and updating them in the coming months and years. The PDD will also continue to develop videos to promote and summarise events and research activities as well as husbandry skills and other appropriate material.

Thank you!

Finally we would like to thank all producers, staff and advisors who contributed to this project, your time and input was greatly appreciated. Additionally, John Moriarty, the student on the DIGIPIG project has recently submitted his thesis to UCD and will be completing his time with us in the PDD at the end of this month. It has been great to have John working on this project and we would like to wish him well in his future career.

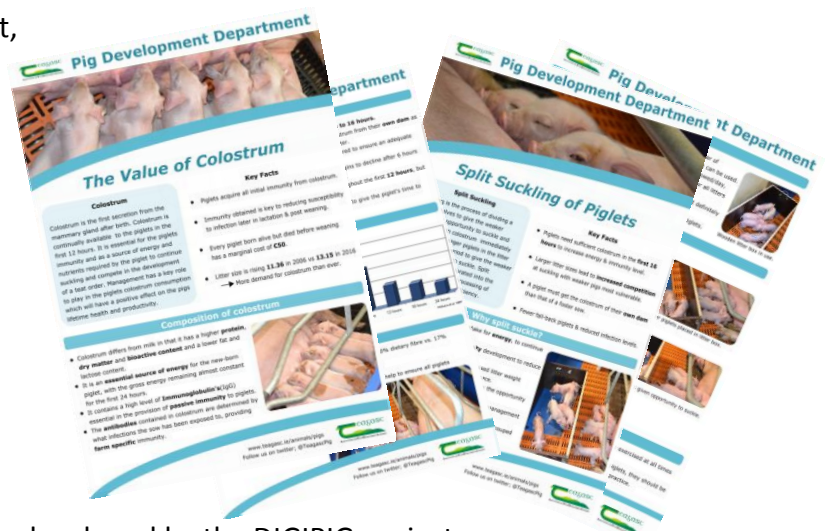
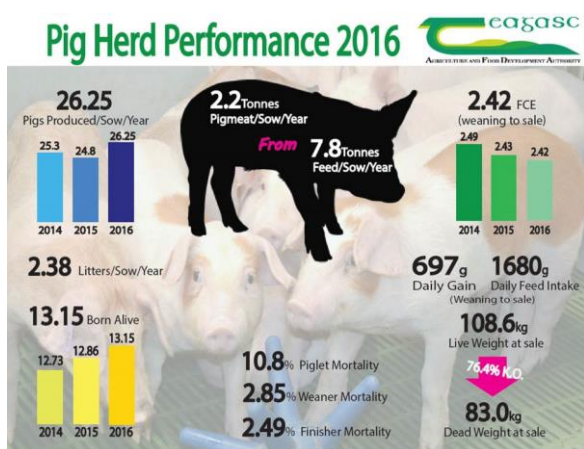


Figure 1. A sample of tools developed by the DIGIPIG project.

PathSurvPig (PSP) goes to China! – Participation in the 25th International Pig Veterinary Society Congress & visit to a 4,400 sow farm

Julia A. Calderón Díaz & Rose Fitzgerald



From 11th to 15th of June, Julia A. Calderón Díaz, postdoctoral researcher on the PSP project with the Teagasc Pig Development Department and Rose Fitzgerald (PSP PhD student at Cork Institute of Technology) had the opportunity to attend the 25th International Pig Veterinary Society (IPVS) congress in Chongqing, China. The congress was attended by 5,000 delegates from 42 different countries. The theme of the congress was “Healthy Pig, Safe Pork” and there were 8 main topics discussed during the 165 conference presentations and 738 posters. Topics included viral diseases, bacterial diseases, emerging and re-emerging swine diseases, swine production and welfare, veterinary public health and food safety, nutrition and herd health management, swine farm management and environmental control and a special session dedicated to research about porcine respiratory and reproductive syndrome (PRRS).

PSP work was presented under 2 of the conference topics. Rose presented a poster about the “association between production flow and respiratory pathogens on a farrow-to-finish Irish commercial farm” during the Swine production and Welfare session and another poster about the “sample to positive (S/P) antibody ratio of 4 porcine respiratory diseases in pigs from 3 age groups in a farrow-to-finish commercial Irish pig farm” during the Swine Farm Management and Environmental Control session. Two more abstracts showing PSP findings were presented in the Swine Farm Management and Environmental Control: “Strategies to manage body weight variation on a farrow-to-finish Irish pig farm” as a poster and a presentation on “Cross-fostering practices in a farrow-to-finish commercial farm”.

Besides presenting PSP research, there was also the opportunity to visit a 4,400 sow farm (the Zhongxin farm) from the Tianzow Breeding

company. Tianzow Breeding is a pig genetics supplier founded in 2004. Their goals are to become the most popular pig genetic company in China and to create a new model for the development of China's pig industry.



Figure 1. Tianzow Breeding farm.

Currently, Tianzow have 80,000 sows that developed from Canadian and French purebred Landrace, Yorkshire, Pietran and Duroc, and has the capacity to supply over 500,000 gilts [including great-grand parents(GGP), grand-parents (GP), and parent stock (PS)] annually to the Chinese market. Tianzow breeding expects to exceed the production of 1.2 million gilts by 2022. So far, Tianzow breeding has developed two genetic product lines that integrate GGP herds, production of frozen semen and a genetic selection program.

The Zhongxin farm covers an area of 80,000 m² including a visitor viewing area (figure 2), a gilt development unit with a capacity of 400 gilts per batch, gestation and farrowing houses (figure 3), manure fermentation room (figure 4) and a biogas production unit. The sow barn is 7820 m² and can house 1,960 sows in individual gestation crates and 400 sows in farrowing crates.



Figure 2. All facilities can be observed through the observation station in the corridor.



Figure 3. Sow barn at Tianzow farm.

The farm breeds 4,400 great-grand parents of Landrace, Yorkshire, and Duroc. On average, a sow produces 28 pigs per sow per year and 2.35 litters per year. Annual replacement rate is 35% and, on average, sows are culled on the 7th parity. Pre-weaning mortality is 6.3%. Pigs are weaned at

21 days and transferred to a finisher facility located in another site. Zhongxin farm is a disease free facility.

Three breeds are produced at the farm. Tianzow Duroc is selected for genetic traits such as growth rate, feed conversion efficiency, and conformation traits. Tianzow Landrace is selected for larger litter size, adaptability, higher growth rate and primary traits such as good feet and leg conformation, heavy muscle and higher carcass yield. Tianzow Yorkshire is selected for larger litter size and heat resistance. Landrace × Yorkshire F1 gilts are crossed with purebred Duroc to produce market finisher pigs. Some production parameters for the different breeds are presented below in Table 1.

Table 1. Production parameters for Tianzow purebred Duroc, Landrace and Yorkshire pigs.

	Duroc	Landrace	Yorkshire
Litter size	10.7	13.2	14.6
Number born alive	9.5	12.2	12.9
Birth weight (kg)	1.6	1.5	1.5
Weaning weight (kg)	6.8	6.5	6.3
ADG 30- 100 kg (g)	948	903	886
Age at 100 kg (days)	147.6	149.5	151
Kill %	65.5	64.2	63.5
FCE	2.35	2.37	2.45

Tianzow has developed a management strategy which combines 4 supporting elements including barn construction, production technology, operating management and animal sales management for swine production. Regarding barn construction, the farm has been built under the *Yu* design, which aims to achieve an “ideal” status by reaching the “three NOs and four SAVEs” concept as well as using innovative concepts to achieve a warm climate during winter

and cool temperatures during summer inside the barns.

The “three Nos” are: NO sewage, NO odour and NO mosquitoes and flies. No sewage is achieved by using an automatic scraper to remove the manure and by cleaning the manure by urine submerging plus ectopic fermentation. No odor (although we think reduced odor would be a more appropriate term) is achieved by cleaning, disinfecting and sterilizing barns between batches. No mosquitos and flies is achieved by covering all windows and holes connected with the barn with mosquito screens. Additionally, all dead pigs are incinerated promptly on farm.

The fermentation pad (figure 4) is a mix of *bacilli* with sawdust, husk and wood chips. The liquid portion from faeces and urine is sprayed to the surface of the fermentation bed where a machine stirs the mixture 1 to 2 times a day. The manure is fermented for about 3 days and once fermented it can be used as an ingredient for organic fertilizers.



Figure 4. Manure fermentation room.

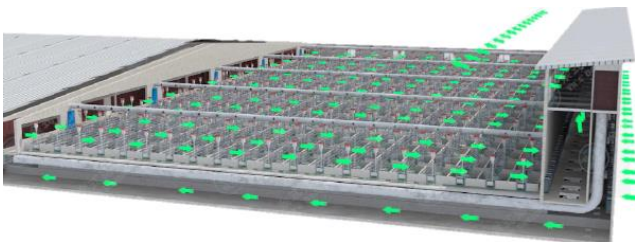
For biogas production, manure is degraded via anaerobic organism fermentation. The biogas

liquid is temporarily stored in a biogas liquid tank. In case the manure degradation system breaks, there is a 6,000 m³ emergency black film pond for environmental protection.

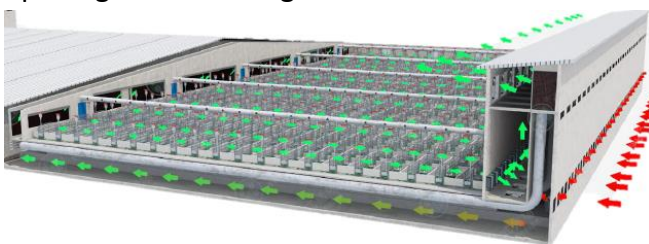
The “four SAVES” are: SAVE land (production of 120,000 finisher pigs per year providing 1.4 m² per finisher); SAVE cost (by investing only ~€2,700 per sow space); SAVE energy (barns are designed and constructed with fully enclosed heat insulation system, natural lighting, and natural ventilation); and SAVE labour (300 sows per farm staff, 3,000 weaner pigs per farm staff and 4,000 finisher pigs per farm staff).

In each barn, there are three climate control systems:

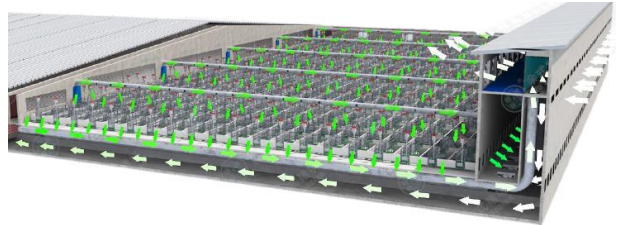
- A natural ventilation system. Air enters through the side wall openings and air recirculates inside the barn and goes out by the openings in the ceiling.



- Summer heating. Hot air of summer months (temperature can reach up to 37°C) enters through the side wall openings and it is cooled in the cooling cells located in an underground tunnel. After cooling, air re-circulates in the barn and goes out of the barn through the openings in the ceiling.



- Winter heating. Air enters through the openings in the ceiling and gets heated in the underground tunnel. Then hot air comes out by the pipes heating the barn. 50% of hot air goes out by the opening in the ceiling while the remaining 50% re-circulates in the barn.



In terms of bio-security, the farm main gate is secured with a fingerprint lock. At the gate, there is a footpath with a disinfection pool. Also, there is a temporary disinfection storage room for sterilizing and storing materials from outside the farm. The farm also monitors biosecurity with a bio-security tracking system. Each employee has an app installed in their mobile phones to track their movement inside the farm. This allows the farm manager and the veterinarians to monitor, in real time, the movement of potential pathogen carriers (people, equipment, trucks) that could create a bio-security risk in the farm.

Overall, visiting the Zhongxin farm was an interesting experience. Once again, the PSP team would like to thank all the farmers involved in the project for allowing us to conduct the trials we presented at IPVS on their farms.

If you would like a copy of the abstracts presented at IPVS or for more information on the Zhongxin farm, please contact Julia at Julia.calderondiaz@teagasc.ie.

Water- The Forgotten Nutrient

Emer McCrum

Water is the nutrient required in the greatest quantity by pigs and as such, a fresh, clean and readily available supply throughout the farm is essential. Water is a necessary requirement for many bodily functions in the pig and insufficient intakes can negatively affect feed intakes, feed conversion, reproduction, milk production, feed digestibility and the welfare of the animal.

Water Requirements

It is a legal requirement within the EU to ensure pigs aged two weeks and over have permanent access to a sufficient quantity of fresh water. The amount of water required by a pig is dependent on a number of factors including weight and age, temperature, nutrition, health status, feed intake, housing and the presence of stressors in the animal's environment. Appropriate flow rates should be set for each stage of production to ensure the pig can consume its target water intake. This is particularly important as pigs by nature will not spend a long time taking water. Low flow rates are associated with reduced intakes while excessive flow rates can lead to water wastage. The table below indicates the average water requirements and minimum flow rates for each stage of production.

Flow rates in each drinker should be monitored at least once per year and can be easily done using a measuring jug and a timer. It is also useful to measure the flow rates of the drinkers closest to and furthest from the water supply as differences here may indicate a problem with water pressure or a blockage in the line.

Table 1. The average water requirements and appropriate flow rates for each stage of production.

Stage	Requirement (L/Pig/Day)	Flow Rate (L/Min)
Piglets	1-2	0.3
1st Stage Weaner	1-5	0.3-0.75
2nd Stage Weaner	8-12	1.0
Finisher	12-20	1.0-1.5
Maiden Gilts	12	2.0
Pregnant Sows	12-25	2.0-4.0
Lactating Sows	10-35	2.0-4.0
Boars	8-20	2.0-4.0

Delivery of Water

Drinking is the main source of water intake, usually via a nipple or bowl drinker. It is recommended that at a minimum there should be one bowl drinker for every twenty pigs and one nipple drinker for every ten pigs in a pen. Research has suggested however that the addition of a second drinker into a pen can improve FCE by 0.09 in pigs weighing 33-122kg. The positioning and height of drinkers is very important. As a rule, drinkers should be positioned at the shoulder height of the pig with both the smallest and tallest pig in the pen able to reach. If there is a variation in the size of pigs in a pen or if pigs are housed in a pen for a longer period, it might be necessary to install additional drinkers at varying heights to ensure all pigs have unrestricted access to water.

Most units have nipple drinkers installed as bowl drinkers can be easily fouled and require regular cleaning but there are a number of advantages associated with bowls. In general, pigs learn to drink earlier from bowl drinkers than from nipples, and this is particularly important for newborn and newly weaned pigs. If bowl drinkers aren't installed in the farrowing and 1st stage weaner houses, an additional source of water should be provided in a tray or piglet drinker to ensure intakes aren't impaired as pigs learn to use nipples. Less water is wasted from bowls and it is easier to see if water is available to the pigs compared to nipple drinkers which should be manually tested to ensure water availability - don't rely on the drips from the nipple to tell you it is working!

Water Quality

Water quality can affect both water intake and animal health and is a common yet costly oversight on units. As a rule, the water provided to pigs should be fit for human consumption. If there is any doubt concerning the quality of the drinking water, samples should be taken without delay and analysed to verify it is acceptable. Water should be tested at both the source if there is a well on the farm and at the delivery point in the pen. In general, water quality can be determined by measuring its biological and chemical properties with pH, total bacteria count (TBC) and hardness tested for as standard.

- pH: pH is a measure of how alkaline or acidic the sample is and a pH result between 6- 8.5 is acceptable for drinking water. High pH can be corrected by water acidification which lowers the pH of the stomach thereby

improving gut health, something that is of particular importance with younger animals.

- Total Bacteria Count: TBC is a measure of the microbial count in a sample and while a reading of 0 colony forming units (cfu/ml) is ideal, a result of 50cfu/ml or less is considered good quality. If a sample returns a reading of coliform levels in excess of 90-100cfu/ml, it is recommended to chlorinate water and if there is a well on the farm ensure there is no contamination here.
- Hardness: Hardness essentially measures the levels of the minerals calcium and magnesium in the water. While hard water doesn't negatively impact on pig performance, it can interfere with in-water medication and high levels can lead to an accumulation of scale in the system. A result of 60 ppm or below of calcium carbonate (CaCO₃) is deemed acceptable and if hard water is a problem, softeners can be installed.

Water sampling is relatively low cost at approximately €50 per sample and it is recommended to test water quality at least twice per year. It is also important not to forget the pipes of the water system as biofilm can build up over time which can lead to biological activity in the water lines. It is best practice to routinely flush water lines with a hydrogen peroxide product to remove any build up.

Water is the single most important nutrient and the implementation of an effective management programme, including routine testing, contributes to a good foundation for a healthy pig and optimum performance in all stages of production.

Carbon Dioxide Shortage

In recent days the shortage of carbon dioxide (CO²) supplies has been widely reported, largely for its impact on fizzy drink and beer supplies. However, there is a very serious potential consequence of this shortage on the pig and poultry sector due to the quantities required for CO² stunning in slaughter plants across the country. The shortage is reportedly a consequence of a number of CO² producers in northern Europe closing for maintenance and technical failures coupled with an increased demand from the beverage sector. This could result in animal welfare issues on pig farms as plants may need to reduce slaughter numbers resulting in farmers being forced to retain slaughter age pigs on farms for additional time, resulting in pig numbers exceeding the capacity of the farm temporarily causing overcrowding. While limited information is available on the timeframes surrounding this shortage, it is hoped that available supplies may be prioritised towards slaughtering plants to avoid such serious welfare consequences.

Student Success

PDD Walsh Fellow John Moriarty attended the 57th IALB/7th EUFRAS conference “New challenges in Rural Areas – Tradition & Transforming Agriculture” which took place in Hungary this month. EUFRAS is the European Forum for Agricultural & Rural Advisory Services, of which Teagasc is a member. A poster outlining the recently completed DIGIPIG project outcomes

was presented at the conference, generating significant interest from advisory personnel throughout Europe. We were delighted that the poster was announced as a prize winner, joining two others across the “agricultural extension”, “farm management” and “training tools for advisors” categories. Posters were selected based on relevance to and replicability in advisory services throughout Europe and internationally and poster design.

PDD Animal Health All Star Award Nominee

Laura Boyle is one of three final nominees for an Animal Health All Star Award in the Intensive Livestock Production category this year. The award is sponsored by Interchem. She has been invited to participate in a conference call in July to establish who is the overall winner who will be announced at the Animal Health All Star Awards in the Clayton Hotel, Ballybrit, Galway next September. The PDD wish Laura the best of luck!

New Masters Position Available

The Irish Pig Health Society has provided funding of €1,500 towards a MRes position, which will be jointly run through Teagasc and UCC. This masters project will be the first study into the management of sows and piglets in free-farrowing crates here in Ireland, and applications are now welcome. Further details are available here: <https://www.teagasc.ie/about/research--innovation/postgraduate-fellowships/other-postgraduate-opportunities/>

For More Information

This newsletter was edited by Amy Quinn, Pig Development Officer, Teagasc Moorepark, Fermoy, Co. Cork. For more information on any of the newsletter content please contact Amy at amy.quinn@teagasc.ie or at 025 42585



Please visit our website at www.teagasc.ie/pigs/