

Discussion of the behavioural factors evident in farmer approaches to dealing with specified challenges facing the EU pork industry

Abstract

The uptake of new ways of working is often triggered by not only a pressure or challenge perceived by a person, but also by some form of push or pull factor – a ‘motivator’. These are given different terms but can be thought of as a nudge or push to take the leap from what has been done traditionally to a new process. EU PiG ran a Grand Prix challenge over four years that specifically asked EU pork producers (farmers) across 13 countries how they would deal with a named challenge. Over the four years, there was a total of 830 responses to 32 separate challenges. The proposed solutions for those challenges have been assigned a suggested motivator based on the RESET model – a suggestion based on the RESET descriptors of what is the likely factor that dominated the producer’s choice of strategy to deal with challenges. The distribution is heavily dominated by tools and technology as solutions to challenges. However, education of groups and of how producers complete their own internal production processes also dominated solutions. Interestingly, some specific challenges around engagement with consumers showed bias towards social interactions and society as a motivator for change. Others showed that legislation was essential to encourage a step into new production models, either as a pull due to guaranteed market protection or as a push due to potential non-compliance.

Introduction

EU PiG is a consortium of 19 industry partners (research, allied industry, NGOs and farmer-led organisations) across 13 countries. Established at the end of 2016 and running for four years, the aim of the consortium was to establish a network of actors who could identify using regional networks’ (RPIGs) best-practice solutions to industry problems. To set a scope for the programme, challenges were established under four central themes:

- Health – specific challenges around disease (primarily, prevention through increased biosecurity), vaccinations and antibiotic usage
- Welfare – specifically of pigs as production animals, but with some fringe benefits to staff
- Meat quality – initially, this was concerned with the perceived quality of pork as a product, its lipid profile and impacts on taste, e.g. boar taint. Increasingly, it was concerned with the relationship between producer and consumer and looked at multiple solutions to the valorisation of pork as product to the consumer
- Precision – encompassed the use of data and technology to support the other themed areas. Increasingly as the project progressed, this focused on environmental factors and production performance

Each theme was coordinated by a work package leader (WPL) who recruited and coordinated a group of thematic experts to assist in the shortlisting, analysis and evaluation of the challenges and best practices.

The Grand Prix started with asking the RPIGs to score challenges submitted by those entering the Grand Prix in previous years (in year 1, these were decided by the consortium). Once eight challenges (two per theme) had been decided by the consortium, these were released to industry and the RPIGs started to identify best practice in each country. Best-practice suggestions were entered into a GIS base camp to track the distribution across the EU, before the entries were summarised to include: a general description of the best-practice solution, the cost–benefits in brief

and any transnational impact. The combined entries were then split into theme and reduced to a top five by the WPL and the thematic groups of experts for each theme.

A top 40 (five possible best practices per challenge – 10 per theme) were then distributed to the RPiGs. These were scored based on potential impact, replicability and applicability to the wider EU industry. From this top 40, eight winning ambassadors were chosen, from which more detailed case studies were produced. These included videos, picture stories and how-to factsheets translated into as many as 10 languages for use across the consortium.

A summary of the challenges across each theme and year (Fig. 1) can be seen below:

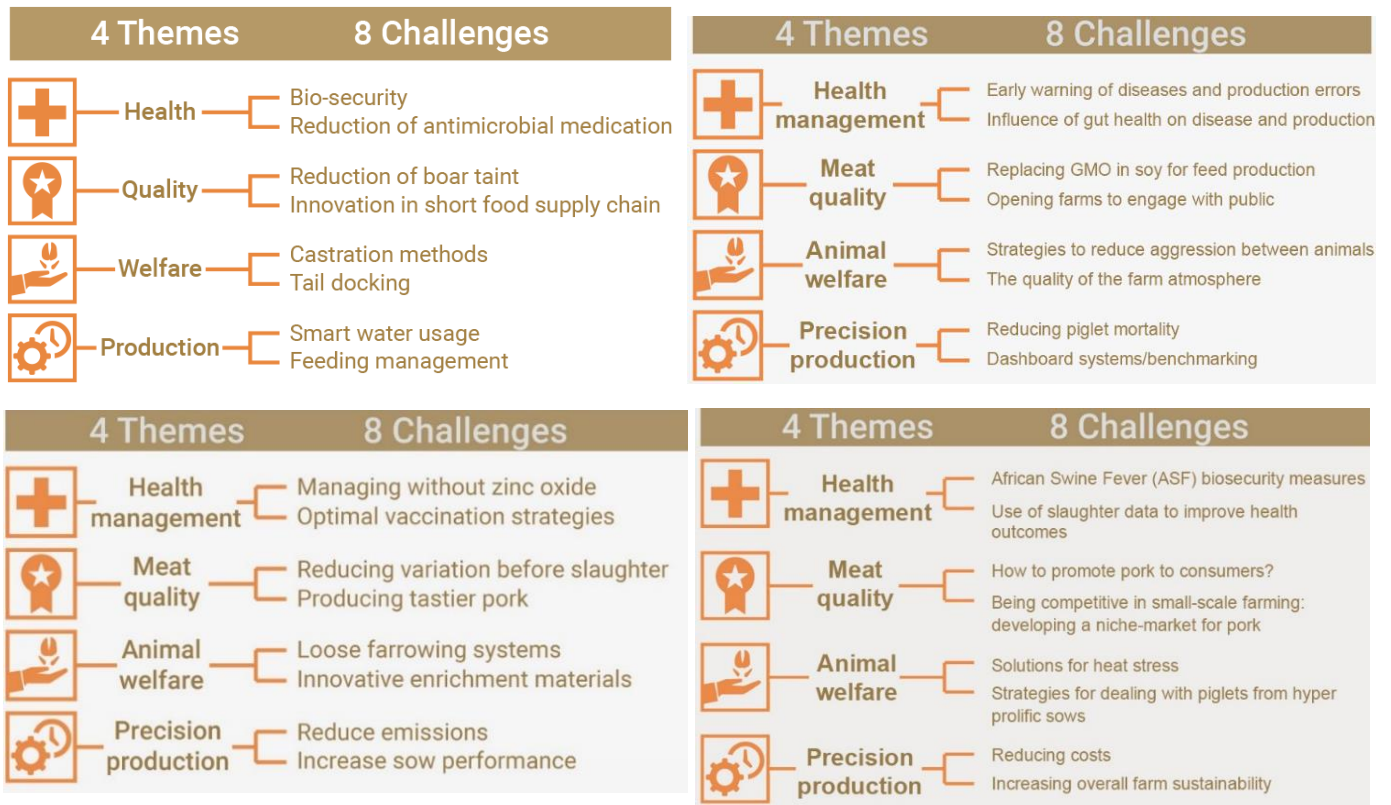


Figure 1. EU PiG challenges by theme and by year. Top row (l) – Year 1, top row (r) – Year 2, bottom row (l) – Year 3 and bottom row (r) – Year 4

The Grand Prix served as an opportunity to ask producers: how do you deal with challenge? The resulting responses have been assigned a primary motivator under the RESET model. RESET is a categorisation of factors that encourage behaviour change (Fig. 2).

Under the model, motivators include regulation, i.e. the use of legislation that in effect forces change. This kind of external motivator is often referred to as a push factor as those affected by this legislation are pushed into making change rather than encouraged through self-motivation. The factor should be considered external motivation as the choice is removed from the participator. An example from everyday life would be legally enforced speed limits.

Using the same example, economic benefits are again external to the motivation of the individual. These can be both push, e.g. fines for non-compliance, higher insurance premiums for those with

speeding convictions, or they could be pull, e.g. lower insurance premiums for those who comply and have a 'clean' licence.

Social motivation could be considered from the perspective of pull motivators, i.e. a desire to collaborate for the greater good, a desire to be part of a group of peers, or it could be a push, e.g. societal pressure to conform. Taking our example of speeding, the use of smiley or sad faces on speed signs, images of children near schools and safety signs drawn by children are all designed to appeal to our societal conscience and encourage conformity with societal norms and would be considered external motivators. The desire to be seen as a safe driver, however, is about the self and our perception – the motivation in this case is internal.

Education is the use of skills, either provided or already acquired, to look at how you can change your own performance and process. While there may still be external actors providing that skills base, the intrinsic motivation is internal, i.e. there is a desire by the person to utilise that knowledge and those skills. An example using the concept of speeding would be driver education courses provided by an external supplier – the motivation to use those to change habit still needs to be on the part of the individual.

Finally, there are tools – these are often in the form of technology. In the driving analogy, speed-restricting technology, cruise control and black boxes are all examples from everyday life. These, by their very nature, are designed, operated and maintained by external stakeholders. As such, the motivation for their use, including the marketing and demonstration of value, would be seen as external motivators – pull factors not in the direct control of the individual.

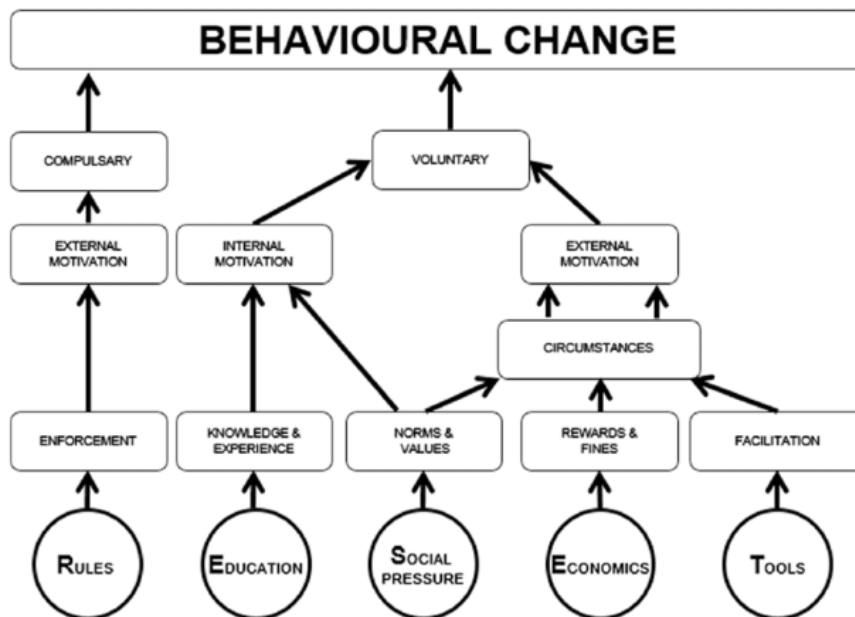


Figure 2. Reworking of the RESET model from Lam et al. (2017) based on the model proposed by Woerkum et al.

Previous research by Lam et al. (2017) described the RESET model as a tool to change farmer mindsets in the area of udder health, with the aim of decreasing the use of antimicrobials in the treatment of mastitis – a complex challenge faced by producers across Europe and with a range of viable solutions. The same behavioural drivers could underpin the motivations of pig producers when tackling industry challenges.

In the case of pig production, regulation can be that of traditional policy enforced by government to ensure health and welfare standards are met. Regulation can also be audit requirements that ensure access of a product to a specific market and also those regulations that protect named products and production systems, e.g. protected designated origin (PDO).

Education according to the RESET model concerns knowledge and experience used to drive internal motivation. For the purpose of this analysis, internal motivations to change processes not necessarily linked to a specific tool, trials and experiments with multiple resources or the desire to educate were all included under the category of education as the motivator.

The pig sector is largely a closed industry, as such, social as a motivation factor was linked to any best practice that identified opening up the farm (unless it was explicitly described as education for schools) or that involved multi-actor groups designing the solution as a team.

Economics should be considered a motivator for all of the best practices submitted as each was sent with an accompanying (very brief) outline of top-level costs and benefits. Table 1 shows the average change in costs of production by theme and by year. The table clearly shows that there has been a consistent change in the total costs of production with a consistent decrease in costs where a best practice has been implemented. The exception to this rule is in the theme of meat quality, whereby producers often seek higher valorisation of products at the expense of additional costs of production. Where economics was allocated as a motivating factor in this analysis, there was an explicit comment relating to a desire to improve costs, value or efficiency of production, i.e. costs or value had to be named as a motivating factor.

Table 1. Changes in total costs as a % of total costs of production by theme and by year (2017, 2018 and 2019) for the EU PiG ambassador best practices

Theme	Year	Challenge 1 – % change in cost of production (cost per unit of saleable goods)	Challenge 2 – % change in cost of production (cost per unit of saleable goods)
Health	1	-1.3	-9.3
	2	-4.9	-0.7
	3	-1.7	-3.3
Average		-3.5	
Welfare	1	-2.7	-
	2	-1.3	-7.6
	3	-1	-3.2
Average		-3.16	
Precision	1	-3.06	-2.72
	2	-4.8	-4.9
	3	-0.4	-5.2
Average		-3.51	
Meat quality	1	+7.9	-
	2	+6.8	+7.6%
	3	-1.81	-
Average		+5.2%	

Tools, or more often in the case of the pig sector, technology, are commonplace and often act as a catalyst to make change. They enable a producer to achieve what they could not achieve before. This inability to achieve the same goal alone is usually characterised by:

- A lack of previous access to the technology to create a specific product, i.e. rapid PCR techniques for rapid diagnosis of disease
- A lack of skills to design and develop the solutions – characterised by an increase in software options to allow producers to visualise production
- A lack of labour to undertake a task – products that provide automation allow increased productivity without additional labour
- A lack of immediate need – changing landscapes have forced producers to reassess their need for specific technologies, in particular, access to, and use of, renewable technologies such as anaerobic digestion and solar panels

Methodology

An export of the best-practice entries for each year of the EU PiG project was placed in an Excel file. This file was edited down to show the following:

- Year of entry, country of origin, theme, challenge, general description of best practice, cost benefit and transnational impact

Against the information provided, an allocation of the best practice against a RESET motivator was undertaken using the description of RESET factors outlined in Lam et al. (2017).

Regulation – Best practices were allocated as legislative or enforced if they explicitly referenced a piece of local, national or EU legislation, an assurance standard or description of quality/provenance enshrined in EU law, e.g. PDO. Examples would include Kintoa pork production from 2020 that specifically references the use of the PDO to protect the provenance and thus value of the product. It should be noted that while there was clear economic motivation in the valorisation of the product, it was the explicit inclusion of the legislation, or acknowledgement that a lack of legislation impacted valorisation, that resulted in a categorisation as regulation. This is because despite both regulation and economics being externally influenced factors, the presence of national legislation and assurance standards make the adherence to regulation compulsory.

Economics – The presence of a supplied cost–benefit analysis could lead all practices to be linked to economics as a RESET factor. The inclusion of that data was a compulsory component of the entry into EU PiG and not necessarily the primary motivator for the best practice. For the purpose of this allocation, only those best-practice entries that explicitly stated valorisation of product or reductions in costs/increase in production efficiency were allocated to this factor. This included some meat quality entries that stated valorisation of rare breeds, or entries, particularly in year 4 (2020), which identified Lean management processes as their motivating principle. Lean aims to maximise value and would therefore be considered an economic motivation.

Social – The use of consortiums, working groups or active engagement with consumers was allocated as social. Consortia were often between the farmer and the actors that support the wider production process, e.g. veterinarians and allied industries, but also included NGOs, farmer organisations and policymakers acting with benevolence rather than legislative enforcement. They can be summarised as collective partnerships working towards the ‘greater good’. Many practices showed engagement with the consumer – some explicitly state the aim of that interaction is

education, and if done within an education setting or framework, this was allocated to education as a RESET factor despite undoubtedly having parallels with the social motivators.

Education – Any best practice that described a change in overall process that could be clearly identified as being internally motivated, e.g. the change in steps in a process. The investigation of changing tools/technology (unless explicitly named) or techniques to assess impact, were all considered as education, as the submissions of best practice showed that it was an internal motivation to use these practices not an externally identified tool being sold or supplied to producer/farmer. Any best practice that explicitly identified itself as education of children, or a school in which education concerning the best practice was delivered, was allocated as education motivation despite some elements of social motivation being likely.

Tools – In terms of specific tools or technologies, the inclusion was broad, from software systems to simple buckets that contained straw or toys to occupy inquisitive pigs, all the way to the purchase of entirely new buildings and associated systems. If best-practice submissions explicitly named or stated their use, then the allocation was made to the category of tools. This is because despite there being some internal motivation to use the tool, it was the external provision of that tool by successful marketing and sale or by provision from a not-for-profit organisation that enabled the actions to be completed. Thus it is the external motivation that assigns supplied goods to the RESET factor of tools.

Analysis

Across the 830 entries, regulation accounted for 54, economics 54, social 103, education 261 and tools 358 entries of best practice. Figure 3 shows the distribution of best practices between the RESET categories as a percentage of the total entries by category across all four years.

Looking at this graph, it would be easy to suggest that pork producers/farmers are motivated most by tools and technology, with 43.13% of entries being aligned with the purchase, implementation or output of a named tool or technology. These technologies varied from named pieces of equipment, such as toys for enrichment, to entire systems, such as feed, water or in-line dosing systems, all the way up to entirely new buildings. Most common were digital tools – production software that allowed increased visualisation, automation and better data integrity.

The least-cited motivator was regulation and this was dominated by assurance standards as opposed to legislation laid down by regional or national government. Given that the pork sector is already an extremely regulated industry, this may mean that the regulatory motivators are adhered to subconsciously rather than factored in as a conscious motivator.

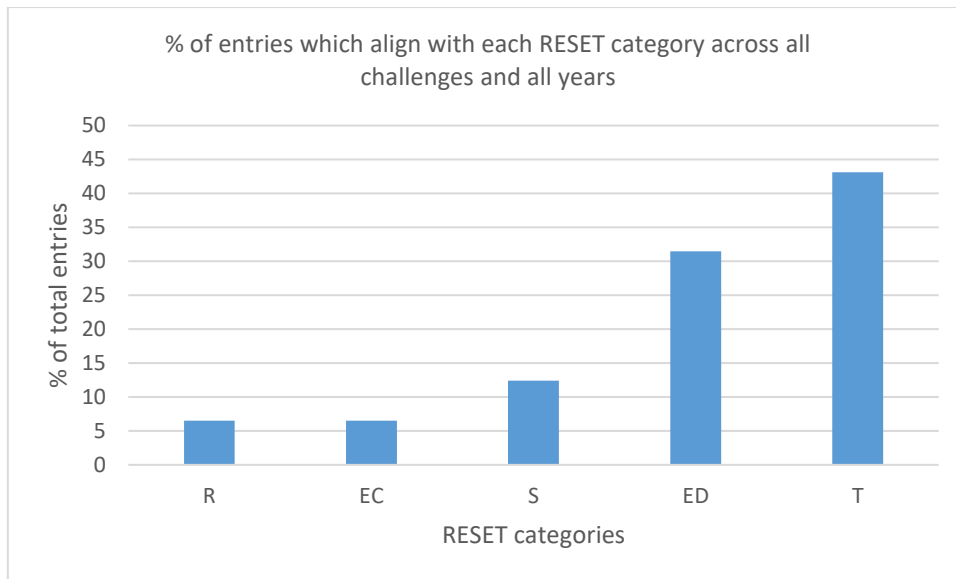


Figure 3. % of entries which align with each RESET category across all challenges and all years

Figures 4–7 show the overall distribution of RESET factors by theme across the four years of EU PiG. They show that there has been an overwhelming bias towards tools and technology (largest percentage of entries) and then education in three of the themes (health, welfare and precision), Meat quality bucks the trend, with social, economic and regulatory all much higher as percentages and social motivators dominating the percentage of entries. Referring back to Table 1, meat quality also did not follow the trend of a decrease in costs of production. This was because meat quality favoured valorisation of product rather than reduced costs of production. This suggests that producers are motivated by different nudge factors when engaging with their external stakeholders compared with their internal processes.

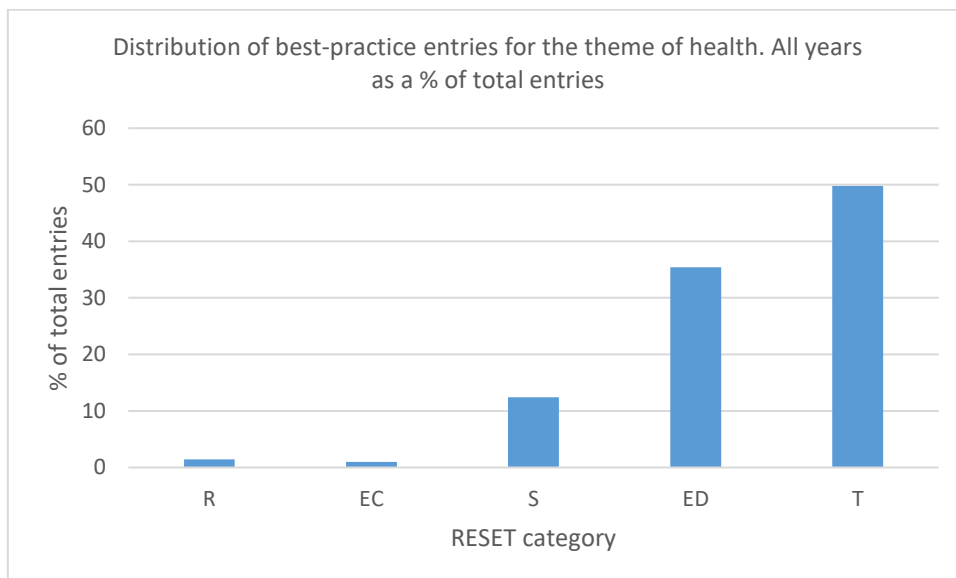


Figure 4. Distribution of best-practice entries for the theme of health

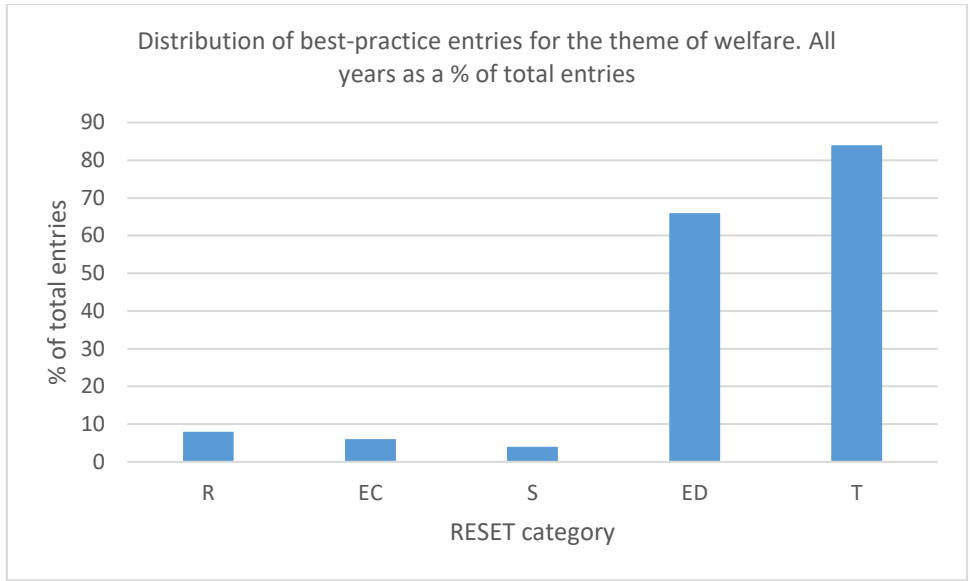


Figure 5. Distribution of best-practice entries for the theme of welfare

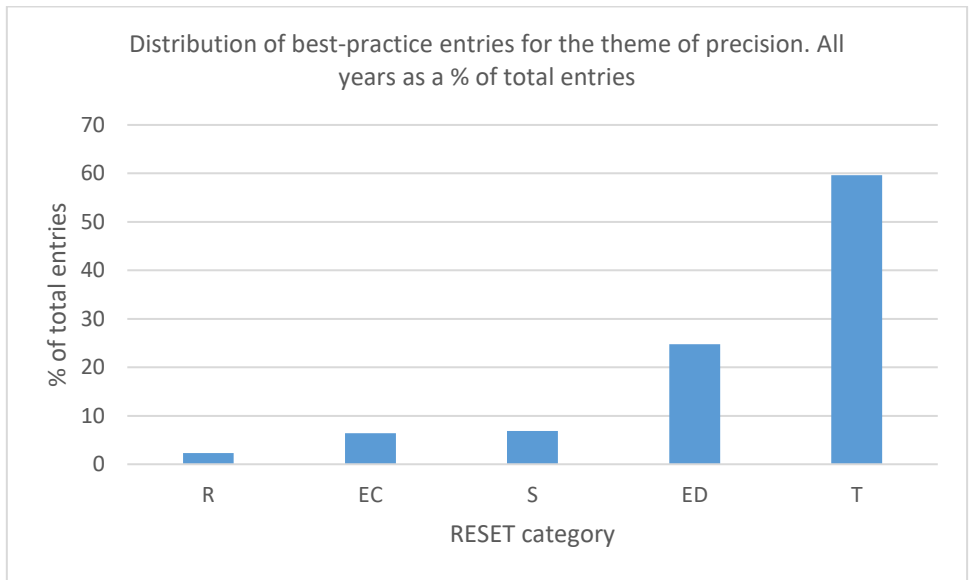


Figure 6. Distribution of best-practice entries for the theme of precision

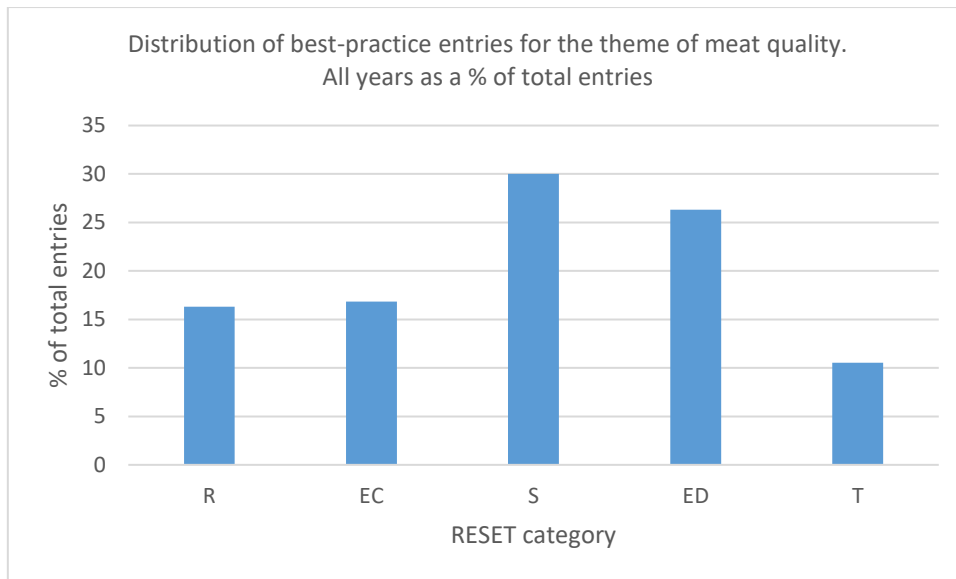


Figure 7. Distribution of best-practice entries for the theme of meat quality

Figures 8 to 11 show the percentage of entries by theme and by individual year. Figure 8 shows the distribution as a percentage of the entries based on the RESET categories. 2017 challenges were set by the consortium rather than the RPiGs and producers on the ground, this was due to the project needing to identify challenges to take to newly formed RPiGs as the timescales set four Grand Prix windows in four years. There were 245 entries in year 1.

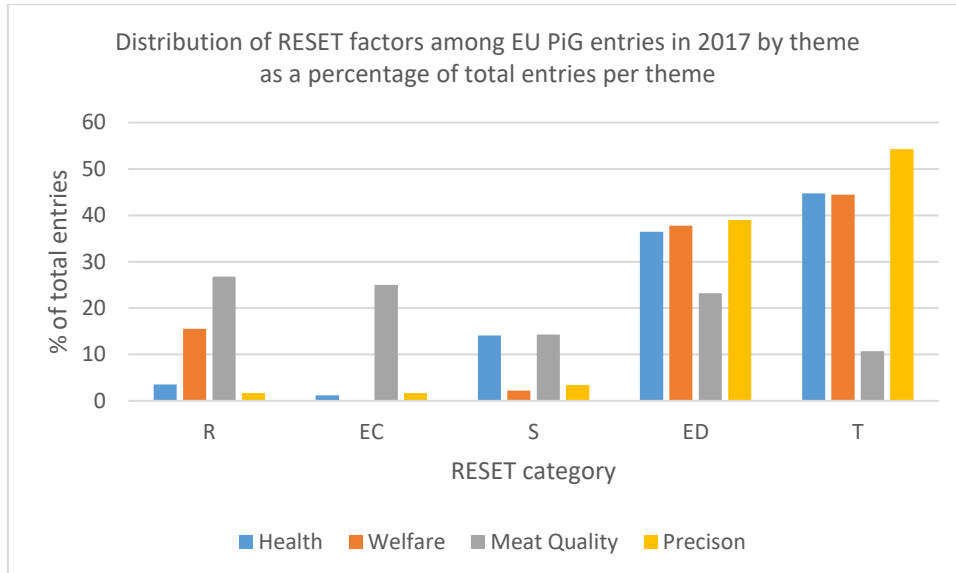


Figure 8. Distribution of RESET factors among EU PiG entries in 2017 by theme as a percentage of total entries per theme

While the majority of themes (health, welfare and precision) are dominated by tools and education as RESET motivators, meat quality shows a very different trend, with regulation and economics being more impactful than tools. In other years, this challenge will come to be dominated by social motivators as the interaction with the consumer develops. The innovations in the supply chain challenge, incorporated some schemes designed to provide consumers with choice but focused on

the use of assurance and regulation to safeguard the product and guarantee valorisation. Research from Barham et al. (2014, 2015) suggested that producers/farmers are more likely to adopt best practice if the risk and ambiguity have been mitigated. In this case, the role of the assurance scheme is to reduce ambiguity for the consumer as to the provenance of the product and in doing so reduce risk to the producer by commanding a fixed valorisation of products.

The other meat quality challenge was boar taint from the perspective of the consumer. The challenge is heavily influenced by legislation around castration that means regulation has a significant role to play in addressing this issue. The challenges in 2017 have a much higher percentage of stated economic motivators compared with subsequent years. While challenges continue to have potentially significant economic benefits for producers (see Table 1), the methodology for cost–benefit assessment changed between years 1 and 2 (2017 and 2018), with each subsequent year having a much more explicit need for cost–benefit as a separate piece of data at the point of entry and a significantly more robust collection and analysis of winning ambassadors (those eight best practices deemed most impactful by the consortium). This explicit change in the recruitment of best practices may have caused less influence being assigned to cost–benefit in the general description of best practices after 2017. The discussion mentions that economics should be considered as a major RESET motivator for most of these entries, even if not explicitly stated.

Figure 9 shows the entries in 2018 – this was the first year that the challenges and the best practices were both identified and scored by the RPiGs, meaning the response to the industry challenges and the potential solutions were truly driven from the bottom up (farmers up to consortium), rather than the top down (consortium to farmers).

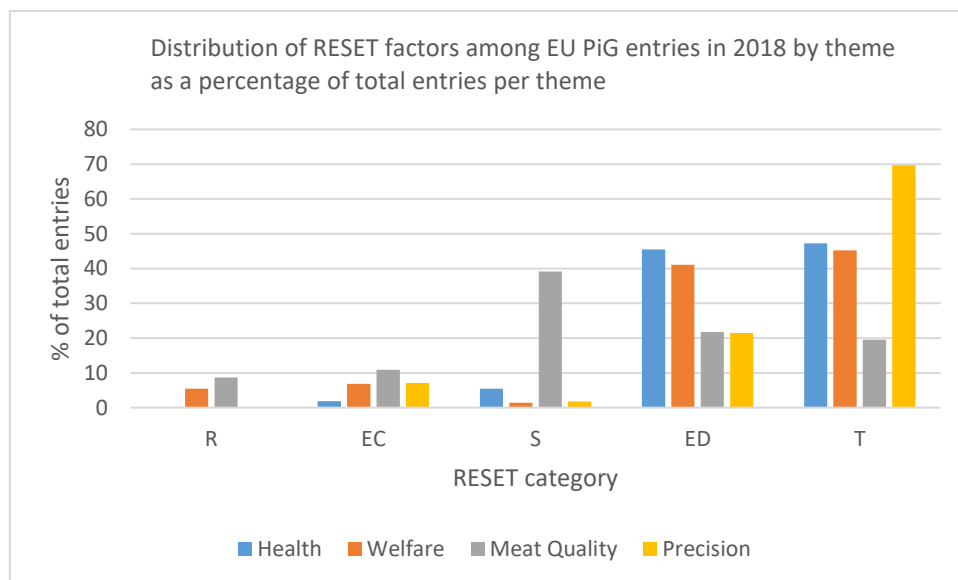


Figure 9. Distribution of RESET factors among EU PiG entries in 2018 by theme as a percentage of total entries per theme

The graph shows a clear bias towards the use of tools to enable significant change to the ways of working posed by industry challenges. The exception to this is meat quality, which is a running theme. In particular, in 2018, one of the meat quality challenges (innovation in a short supply chain) is about engaging with retailers and consumers through marketing. Accordingly, the use of social nudges dominates the RESET factors. Meat quality and welfare are also unsurprising in that they are among the RESET factors that have best practices associated with regulation – in both cases, these were either assurance standards or national legislation that had forced a change. Interestingly,

health has a significantly large representation in the education RESET category. With so many tools and technologies available for supporting the health of pigs, it was interesting to note that many producers are still looking at the underlying processes that need to be improved, even if that requires some technology rather than opting straight away for an ‘off the shelf’ solution. It suggests that producers are concerned with the root cause of the problem rather than dealing with the symptoms.

Figure 10 shows the distribution of entries as a percentage across the RESET categories by theme. In 2019, there were 197 entries across the challenges.

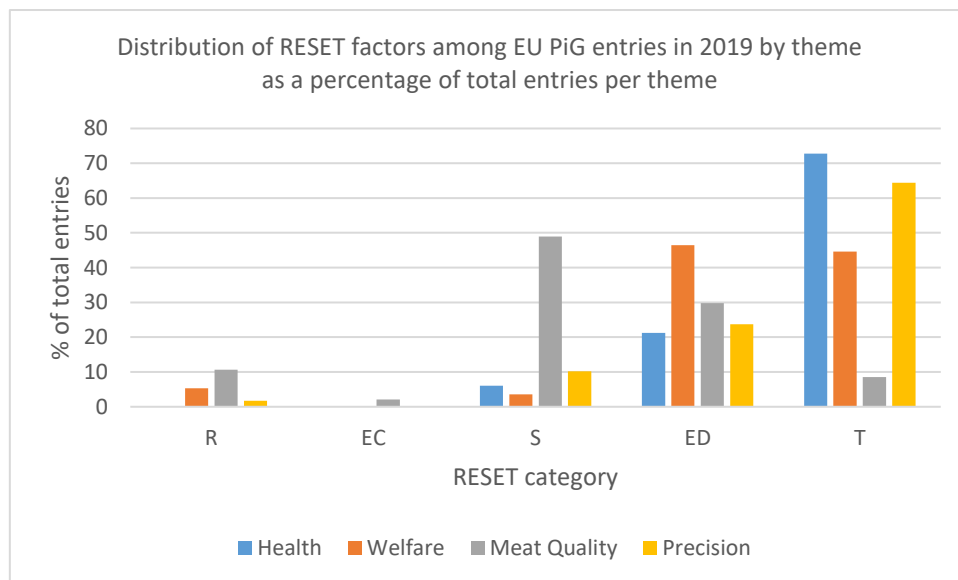


Figure 10. Distribution of RESET factors among EU PiG entries in 2019 by theme as a percentage of total entries per theme

Meat quality again follows a trend of social factors determining the solution to the challenge of producing tastier pork, with the regulation being assurance standards that support a ‘tastier product’. The education and tools in meat quality relate very specifically to the use of technology and processes to homogenise pigs at slaughter to ensure a greater economic return. It is worth reminding readers that the allocation of best-practice solutions to RESET factors is done under an assessment of the primary motivation. The completion of cost–benefit analysis shows that there are often economic factors that provide additional motivation. In fact, even with the limited information available in the best-practice entries, it is possible to assign two to three RESET factors to each best practice. Interestingly, there are substantially fewer explicitly stated economic motivators mentioned in the best practices this year. The challenges from 2019 are a result of significant and sudden increases in industry pressures surrounding emissions and welfare of livestock and the looming threat of disease pressures, in particular African swine fever. This is reflected in the challenges in 2020.

The 2020 challenges were the last set and, as with 2018 and 2019, were nominated by producers/farmers on the ground, chosen by the RPiGs after scoring and then the best practices they generated were also chosen by the RPiGs, continuing the ground-up approach to best practice – a reflection of the mindset of the industry rather than the mindset of the consortium. The number of entries was reduced in 2020, with 160 entries in total across the eight challenges.

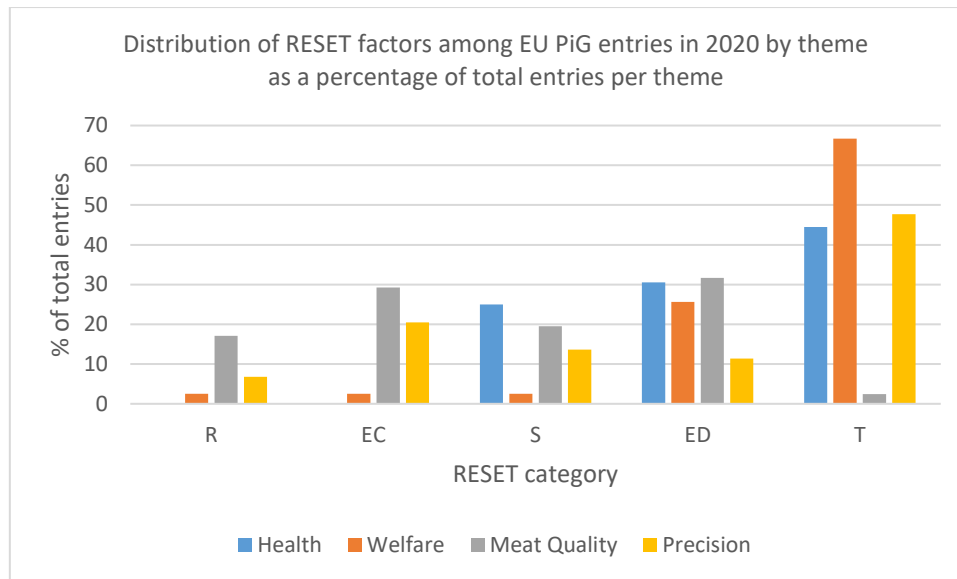


Figure 11. Distribution of RESET factors among EU PiG entries in 2020 by theme as a percentage of total entries per theme

Figure 11 shows a slightly more flattened distribution (although still dominated by technological solutions in three themes) across the RESET categories. This is likely due to the very complex nature of the year 4 challenges. In earlier years, the challenges were very specific, e.g. tail biting or castration in health, both of which happen on farm and at very specific stages in the production process, i.e. pigs are not docked or castrated after a specific age limit as stated in EU law. In year 4, the challenges opened up more options by being less prescriptive in their requests, e.g. the use of slaughter data or solutions to ASF biosecurity encourage a wide range of best practices in terms of processes and solutions across society, industry and process. These are also not legal requirements as seen in year 1, meaning that the lack of legislative rigour and boundaries allow producers/farmers and those technology and tool suppliers significantly more creative rein. The other change or anomaly over other years is the sudden increase in economic motivators, this is likely due to a very specific challenge – ‘reducing costs’ under the theme of precision. Most entries explicitly allied themselves with an economic strategy or motivation.

Discussion

The allocation of a single motivator under the RESET model is an oversimplification and there are often multiple nudges or motivators that impact producers. In the case of the EU PiG programme, the motivators cited as impactful in order are: tools/technology, education, social, economics and then regulation. Tools and education are the most widely assigned motivations, suggesting that there is pressure on EU pork producers to which tools and technology can provide some of the answers, or it is those producers/farmers that have responded with best-practice solutions to industry pressures/challenge that are likely to engage with innovation. This discussion touches on the likely bias in respondents to the call for innovative ‘best practices’. It was mentioned previously that technology was likely to answer solutions to the following issues:

- A lack of previous access to the technology to create a specific product, i.e. rapid PCR techniques for rapid diagnosis of disease
- A lack of skills to design and develop the solutions – characterised by an increase in software options to allow producers to visualise production

- A lack of labour to undertake a task – products that provide automation allow increased productivity without additional labour
- A lack of immediate need – changing landscapes have forced producers to reassess their need for specific technologies, in particular, access to, and use of, renewable technologies such as anaerobic digestion and solar panels

The reliance on tools and technology may raise concerns for farmer dissemination in several EU countries. In the UK, surveys on buildings and associated technology (AHDB, 2020) show that more than a third of pig buildings were more than 21 years old and investment over the last five years was likely to be less than £50,000 – 25% of respondents stated they had invested nothing. The investment situation is not set to improve in the near future – 36% say they will invest the same capital in buildings in the next year and 42% say they will invest less. Furthermore, 35% of pig farmers state they will spend nothing in the next five years. When asked for the biggest barrier to investment, Brexit, the cost of pig houses and lack of available capital were the three most provided answers. Moreover, 66% said that Brexit was at least a slight barrier to investment. When asked about their future approach to farming methods, around half (52%) said they want to build a healthy and sustainable farm business to pass on to the next generation. Large producers are more likely to want to maximise financial return by exploiting technology or new ways of working. The report found that there were three main ways levy bodies, policymakers and/or farmer organisations such as AHDB could assist pig farmers in this area: funding, general help and technical information.

The majority of pig farmers can be described as being wary of risk and gain confidence from seeing others implement something successfully, before they try something new. In short, what people say about their actions does not always bear out in the evidence, i.e. the EU PiG submissions of best practice suggest that tools and technology are widely accepted among our subset, however, this is not evidenced in surveys of implementation elsewhere.

The disparity between other research and the outcomes in this sample are potentially due to a bias in the respondents. Research into uptake of technology is usually categorised by a curve of adoption, often described as a model of diffusion (see Figure 12). Diederer et al. (2003) demonstrated that producers/farmers are no different and are often characterised by those producers who identify as innovators or early adopters and show enthusiasm for adoption of technology despite risks from external factors, such as legislative frameworks and societal pressures. The heavy bias within the submissions to EU PiG suggests that our sample was dominated by innovators and early adopters. This suggests that the EU PiG programme may have only accounted for a small representation of EU producers. While in itself that will mean that the results are likely to have a strong bias, it suggests that we have shown the following: innovators and early adopters are keen to take on new solutions to challenges when underpinned by tools and technology as well as the ability to visualise how they impact their production processes (education). The curve from Rogers (1995) shows that there is a chasm between our potential group and those producers/farmers that make up the majority. Alston et al. (2010) showed that it is important to bridge that chasm as there is usually a lifespan on technical

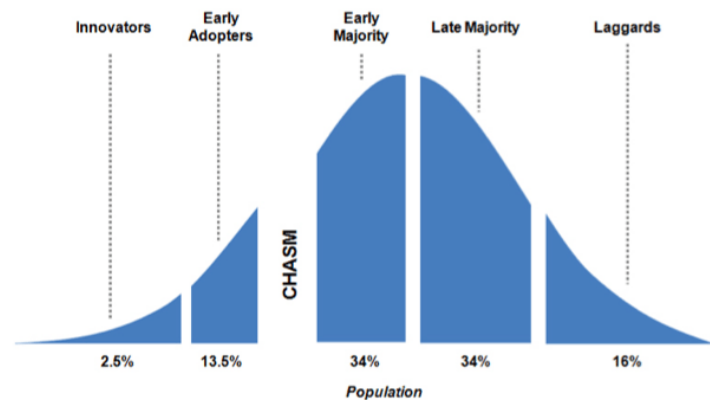


Figure 12. Life cycle of adoption (Rogers, 1995)

innovations in agriculture, identified as a lag between product release and maximum uptake. Alston et al. (2010) estimated that research lags had an overall length of 50 years, with a peak impact at 24 years and most of the impact gone in 40 years.

Education is a core skill found in our sample size and research suggests that this is commonplace among producers/farmers. Casey et al. (2013) found evidence from multiple avenues of research that farmers inherently had the skills independent of other factors, e.g. age, to make changes based on education and the acquisition and application of new skills, and cite research by the likes of McIvor and Aspin (2001) that supports the concept of farmer-to-farmer learning as a key motivator for technology uptake to bridge the 'chasm'. This is supported by research by Rose (2018) on behalf of AHDB. The majority of the research suggests that producers/farmers demonstrate leanings towards Bayesian learning styles, i.e. they will base the uptake of new processes or behaviours on previous experiences and information. While there is research that supports the flexibility of producers, most research shows a heavy leaning towards this style of knowledge acquisition. Barham et al. (2014 and 2015) cite multiple sources of research that show while farmers often learn well from previous experience both personally and from others, they are often steered by other complex external influences described in the cited research as risks and ambiguity.

In agricultural production, a significant source of risk and ambiguity is regulation. The legislative frameworks in which national and international supply chains operate are subject to relatively rapid change. In the EU PiG programme, this saw impacts on best-practice entries, especially from the UK, with producers more focused on business continuity than innovation.

Much of the research cited describes the role that 'peers' provide in education. For the purpose of analysis in the report, those innovations that showed a consortium of peers was allocated as a social motivator, i.e. benchmarking groups formed by producers/farmers, partnerships with vets and allied industry representatives and those that worked with the wider supply chain. These social motivators were more often leveraged for external audiences – in most cases, a consumer of pork products. The use of peer encouragement or pressure was less common, this is despite significant research (Barham et al., 2014 and 2015; Casey et al., 2013; Diederer et al., 2003; and Rose, 2018) showing that the use of peer forums is likely to increase the uptake of technology, innovation and best practice in an agricultural context, i.e. it is from other producers/farmers that the majority in Rogers' curve will get the confidence to bridge the 'chasm'. EU PiG itself sought to utilise RPiGs for dissemination, using farmer organisations' industry representation and 'key influencers' as dissemination vehicles.

In the UK, a Pig Innovation Network (PIN) was established to pull together industry influencers under each of the themes. The members came from:

- Innovative producers – those with a known desire to utilise the latest technology and resources
- Allied industry – those involved specifically with R&D within their organisations
- Veterinarians – pig-specific
- Geneticists – as part of larger integrated businesses
- Academia – those specifically looking at research into pig production
- Technology providers – those that provide technology beyond the state of the art

PIN was designed to be a two-way forum from which innovations and best practice that could be utilised as part of the Grand Prix could be provided by the network and the current best practices and their impacts for industry could be disseminated out. As the UK industry has continued to

consolidate, PIN has been absorbed into the key account management system that AHDB provides to UK producers providing a network of thematic experts to act as consultants in niche production areas.

The social motivator was most common in the theme of meat quality due to the differing economic goals of the producers/farmer. Under the majority of these challenges, there was a desire to increase the valorisation of product rather than seek a reduction in costs of production (COP) through some form of marginal gain. The differentiation between this theme and the others (health, welfare and precision) shows the flexibility of producers/farmers in their approaches, supporting the findings of Casey et al. (2013) and Barham et al. (2014) that farmers are not purely Bayesian learners and will, when there is a risk mitigation, i.e. a significantly higher price, be willing to change their approaches to adoption of new best practice.

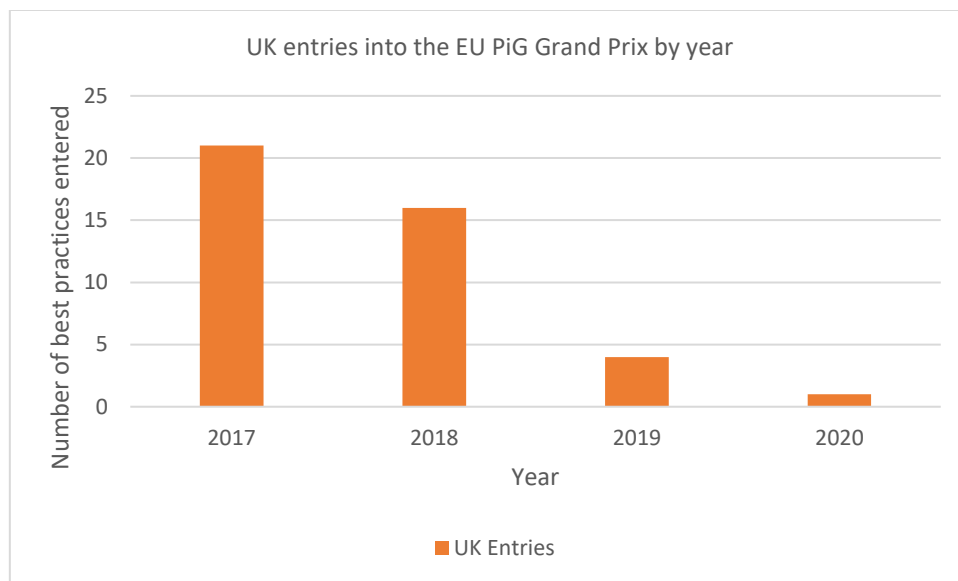


Figure 13. UK entries into the EU PiG Grand Prix by year

Barham et al. (2014 and 2015) argue that mitigation of risk and ambiguity are major incentives for producers. The shifting political landscape during the lifespan of EU PiG is a case study of how ambiguity and risk can impact innovation. Figure 13 shows the UK applications to the Grand Prix by year. Although there was a decline year-on-year, there is a marked decline in 2019 and 2020 when the announcement of BREXIT withdrawals without trade agreements caused significant concerns around the risk to the industry and a lack of clear impact produced significant ambiguity. The use of legislation to safeguard provenance, e.g. PDOs or quality assurance schemes, significantly reduces the risk to producers and increases the uptake of best practice. While it was not stated as a primary motivator across a lot of the meat quality best practices, there is often an alluded standard, loosely referenced or inferred from the description of production or the naming of a specific breed or pig. The other area in which regulation is occasionally cited but more often should be inferred is that of welfare. Each of the EU nations involved in the EU PiG programme has national interpretations of the EU law governing animal welfare. The change of that welfare has been a trigger for the challenge topics, even if the best practices failed to cite it as a primary motivator, e.g. intact tails and boar taint relate to the practice of tail docking (banned as a routine practice) and castration (banned in some countries and likely to be banned in others). Recently, several countries have announced a shift towards free farrowing systems – a challenge previously identified in EU PiG.

Following training in the CASI methodology by Jolanda Jansen, co-author of Lam et al. (2017), AHDB Pork undertook an analysis of which RESET factors were likely to produce behaviour change in UK pork producers/farmers in the areas of practice around tail docking and the uptake of specific technology (RFID identifiers, automated recording systems and accompanying visualisation software). Two independent panels of representative UK producers (n=8 and 15) were assembled and given a practical example of RESET, using the analogy of reducing unsafe driving speeds. They were then asked to undertake a RESET analysis of motivations against both changing practices around tail docking and technology uptake. Both groups completed RESET tasks for both behaviour changes. In both cases, the two RESET motivators cited by assembled panels of producers/farmers as most likely to motivate behavioural change were regulation and economics. With one producer quoted as saying, 'Without regulation? Why would I change?' i.e. there are such small economic margins in pork, unless compliance is compulsory, producers are less likely to shift from one way of working to another.

In the case of precision, economics was noted as the RESET motivator most likely to promote behaviour change. However, the producers/farmers in AHDB test groups noted that there are different motivators as the level of uptake follows Rogers' (1995) curve of uptake of technology. To bridge the chasm, the economics had to support producers/farmers but a reduction in direct costs had to be reduced over time, by scale (niche products commanded a higher price). Once a reduction in price was seen it was acknowledged amongst the group, that regulation was likely required to encourage more use of RFID technology within the growing herd, i.e. those animals destined for production not those used for breeding. The EU PiG programme noted that economics was a likely motivator of uptake of best practice. All of the entries provided data to allow a cost-benefit analysis to be produced. This mandatory requirement, made clear at the point of entry, will have acted as a filter among those producers with a clear understanding of financial motivation and those that are less motivated. The economic motivations became more explicit as the challenges progressed, peaking in year 4 (2020) with specific challenges that targeted economic gains under the theme of precision – reducing costs. Other themes, including welfare, showed best practices that while allocated to education, as they were a change of process, actually demonstrated techniques akin to Lean methodologies from manufacturing. An entry from France – the KALINAT approach – described a process of total productive maintenance (TPM) of sows to ensure less variation in milk and piglet output. TPM is a Lean tool used to reduce the 'waste' in production and therefore improve the COP, i.e. it could be considered an economic motivator. This particular practice saw a fall in total production costs of 3.2% – in a business that survives from marginal gains, this is a significant figure.

The following are possible areas for future further study:

1. Legislation or regulation, according to other research, has a much larger role to play in respect of driving uptake of best practice than openly cited in the EU PiG best-practice submissions. Major changes and investment will only be made in the correct legislative framework, i.e. if there is a lack of clarity regarding environmental legislation, then there will be a lack of investment in technology or solutions to mitigate environmental impact. This suggests that there needs to be significantly more coherence between those disseminating best practice and policymakers implementing legislation. Is there a framework within EU nations that sits farmers either directly or through a representative organisation at the heart of EU policymaking? In the UK, for example, each sector has a lobby group and there are cross-agricultural sectors that have a lobby agenda. However, the main evidence-gathering body that is independent of government and industry has a directive that prohibits a role in lobbying farmers' interests written into its constitution.

2. In order to generate uptake of technology, it is likely a series of RESET motivators need to be used in a very specific sequence to push and pull producers into the implementation of best practices. It would seem sensible that in order for a technology (the most commonly stated motivator) to be taken up by a farmer, there is sufficient reassurance that it is required under legislation, it will deliver a return on investment and be viewed favourably internally and externally. A prime example would be the use of slurry-cooling systems, cited several times in EU PiG entries. Economically, we know slurry cooling provides an economic return through offsetting some gas and/or electricity costs associated with heating pig production systems, but its primary use is the reduction of ammonia emissions to meet legislative standards. We also know that consumers state they want higher standards of production, but in the UK, a large number of consumers have little to no awareness of ammonia emissions from livestock. Less so would they pay an associated increase in food costs to contribute to a change in production that limits emissions from production. This is often stated by consumers entering a supermarket, but upon analysis of their purchases does not match what has been purchased. Consumers often have an economic motivator, i.e. the 'cheapest' economics, that still fits their social motivation.
3. If legislation is less cited as a RESET motivator should it be viewed as the last tool to be implemented to encourage wholesale change? That is, should legislation be preceded by economic motivators, such as grant funding for capital projects, and suitable technical reporting from independent sources to allow producers/farmers to visualise how it can impact their production? At which point is legislation a motivator? At which point does it inhibit uptake of technology?

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