The Jersey Island Cow – A Breeding Plan 2018-2028

Five-Year Interim Review

A Report to the Royal Jersey Agricultural & Horticultural Society

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Summary

Notably, there has been a consistent increase in yield metrics such as milk production (kg), fat (%), and protein (%). Additionally, indicators of genetic merit including Type Merit, Profitable Lifetime Index (PLI), and Sires Fertility Index have shown a steady upward trajectory. Breeders and farmers expressed satisfaction with the overall development of the breed, although challenges such as declining fertility and issues with artificial insemination and semen quality have been encountered. While current bull selection methods are generally deemed satisfactory, some farmers feel that the criteria may be limiting their choices. Importantly, there is continued interest in the importation of semen to diversify genetic stock. The successful selection towards an A2 milk protein composition population has been evident, presenting opportunities for future marketing initiatives within the dairy sector. However, concerns persist regarding surplus calf management. Despite ongoing discussions, breeders and farmers remain opposed to introducing JX bulls into the breeding program at this stage.

Key conclusions and work streams

1. Maintain current Jersey Herd Book licencing arrangements on importation of international Jersey bulls.
2. Research introduction of a more scientifically robust definition to determine purity.
3. Explore methods of increasing awareness of bull selection particularly in terms of compliance with import controls, perhaps by holding screening sessions as open forums.
4. Introduce a Herd Book rule to exclude, or de-register, animals exhibiting phenotypic characteristics not of true Jersey type which is to be described in the Jersey Herd Book.
5. Maintain current suite of breed assessment and development tools.
6. Continue with monitoring quality of imported semen and work with herd managers and farm veterinary surgeons to improve fertility.
7. Maintain both the genomic testing programme and the A2 initiative, but review how it is delivered.
8. Monitor inbreeding drawing attention to published data on individual animals to assist breeding decisions.
9. Examine options for including the Jersey Island data with international populations to both further improve breed management and also assist with establishing opportunities for genetic export.
10. Research feasibility of establishing a semen collection facility.
11. Continue exploration of markets for surplus calves.
12. Encourage Government to develop Island wide emergency contingency plans.
13. Introduce mutually agreed and published formal breeding goals for the Jersey Island cattle population.

Introduction

This report follows the "The Island Jersey – A Breeding Plan 2018-2028" and "Ten Years of Breeding to International Pedigree Jersey Bulls", both published in 2018 by Dr Maurice Bichard.

The recommendations made in 2018 have shaped the structure of this report. The focus of this report is on the changes observed over the last 5 years since those reports were published, whilst acknowledging the major changes within the Island population since 2008.

The iconic Island breed is recognised globally, with pedigree herds gaining in popularity due to their rich milk and economic prowess. In the 5 years since the 2018 review, the number of farms on Jersey has fallen from 28 to 12. The cattle population has also declined from 2,631 to 2,116 cows as recorded in the annual census.

This paper presents a comprehensive review spanning the past 5 years, focussing on the development of Jersey Island cattle.

A literature review was undertaken into the development of the Jersey cattle breed in the Island, and herd performance data was supplied by the RJA&HS and their various data processing partners.

Research was undertaken by direct interview and survey of:

- Farmers, Cattle breeders and Herd Managers.
- Representatives of the Royal Jersey Agricultural & Horticultural Society (RJA&HS), being the key staff involved with the management of the herd and the breed development programmes.
- Representatives of Jersey Dairy (JD), being the key staff involved with management, production and marketing.

1. Results from survey of Farms, RJA&HS and Jersey Dairy

1.1 Observed improvements and retrogression since 2008

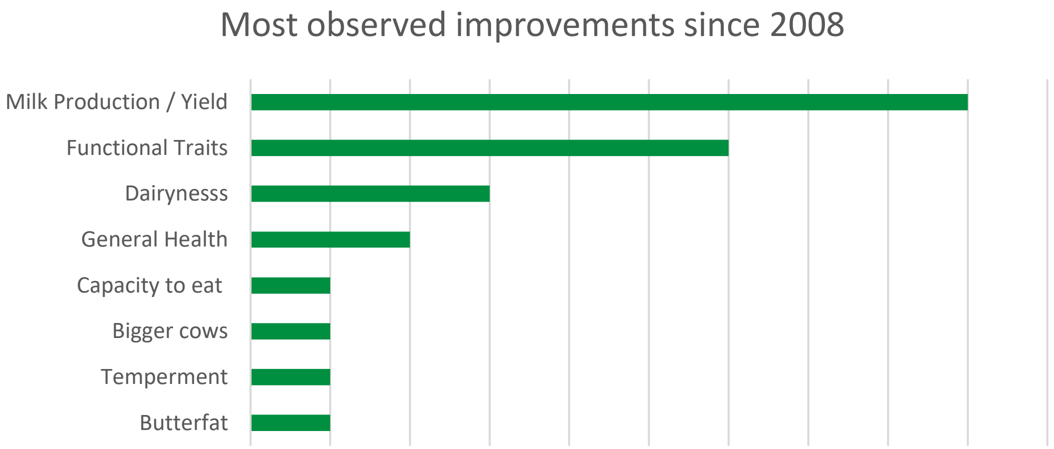
The integration of international semen in 2008 was essential for breed development of the Jersey Island cattle. It diversified the gene pool on the Island and has kept Jersey Dairy competitive in a fast-moving industry. Pre-importation, the Jersey Island cattle were facing a concerning plateau in breed development, expressed by stagnant growth in milk yield per cow. Within a 'closed' population there was limited scope for breed development without increasing inbreeding.

Both the RJA&HS and farmers have expressed that they are more than satisfied with the development of the Jersey Island population since 2008. The most predominant improvements noted by farmers and the RJA&HS have been yield and phenotypic traits, there has been a reduction in hereditary defects such as the 'twisted face' and an improvement in the animal's general vigour.

Views were expressed that high performance comes at the price of a reduction in resilience whereby animals performing at higher metabolic levels are less robust when faced with health challenges.

Other traits that have shown significant improvement were milk solids and, anecdotally, better temperament.

Figure 1.1. Most observed improvements noted by farmers & herdsmen since 2008



Weighting by number of positive responses.

The Dairy has also commended the improvements in the Island herd since 2008. A noteworthy surge in the average yield per cow, escalating from 4,500 litres per annum to approximately 6,988 litres in 2023, has been a striking outcome. The Dairy has said that the more cost-effective farms are, the less frequently they have to go to market to get a price increase. Navigating the current global market, there was an acknowledgement that the Jersey industry has the advantage of being small scale and flexible and thus possesses the agility to respond quickly to market signals.

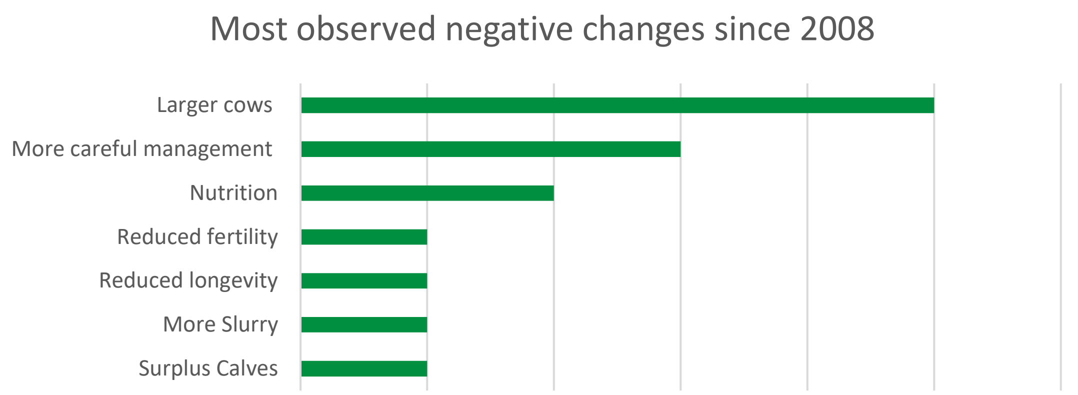
Recognising the dynamics of the dairy market, the Dairy believes the focus has shifted towards the value in butter production, and that future efforts should be made on lifting the component percentages over simple milk volume. However, this shift towards component percentages is not seen in isolation. There is a recognition that an exclusive focus on fats may not be economically or nutritionally beneficial for both the environment and the cattle, given the associated feed requirements for increased fats in milk. Rather, the emphasis lies in driving the fat improvement through genetic enhancements. This follows the specific demands of international markets, where certain protein content thresholds are required, and the costs incurred by the removal of water from milk to achieve these standards.

The Dairy's principal objective now is to achieve a production volume of 14 million litres per annum, committing to scale while optimising returns. Their strategy reflects an intricate balancing act between navigating global market demands, emphasising quality and ensuring that genetic improvements contribute to not only increased yields but also to the overall compositional quality of the milk produced.

Consequently, there have been changes to the Island Jersey since the importation of international semen that have resulted in some changes that, while not categorically problematic, are however undesirable. As a result of the diversified genetics that international bulls have provided, the Island population now produces a significantly higher yield and quality product. For the animals, this means their bodies are performing under higher metabolic stress, which has undoubtably resulted in an animal that requires more careful management than the traditional robust pre-importation type Jersey.

In recent years, there has been an observable decline in fertility rates, underscoring the imperative for a defined approach in the management of this evolved and high performing Jersey population, see appendices.

Figure 1.2. Most negative changes observed by farmers & herdsmen in their cattle since 2008



Weighting by number of positive responses.

1.2 Fertility

In the course of this review, over 65% of farmers or their herdsmen that were surveyed, reported they had experienced a decline in fertility at some point over the last 15 years, with the causative factors believed to be increased metabolic stress and higher management animals. Another factor identified as potentially contributing to declining fertility, was the perceived quality of semen provided, particularly in instances where sexed semen was used.

Prior to importation, it was common practice for many farms to house a bull for natural service as a part of their breeding plan. Many farms are still using natural breeding with a bull if they are experiencing challenges with conception by artificial insemination (AI) and this method is reported to yield positive results for a majority of these farms, however the progeny from these are rarely retained. The Society also commented to agree that, as a result of the production process, sexed semen can be associated with a reduction in conception and rolling pregnancy rates.

In response to the identified fertility challenges, farmers have advocated and adopted several strategies. Foremost among these suggestions is to prioritise high fertility bulls or to run the cow with a bull if AI proves unsuccessful. Additional recommendations were to select for better health traits, diversify semen sources to avoid undue reliance on a single bull, improve farm management (increase consultation with advisors and more frequent analysis of animals at three -week intervals, have more regular AI training) and to improve pre-insemination nutrition.

In tandem with these on-farm strategies, the RJA&HS proposes a structured approach: firstly, using sexed semen to exclusively younger cows/heifers and using Jersey semen for minimal services, followed by beef semen and then a bull. A combination of these reproductive strategies could offer a solution to enhanced fertility outcomes within the Island herd.

Matters that have also been raised by farmers were the increase in twins born this year (2023) and the increasing stature of the cattle since importation of international genetics.

Whilst some males do tend to sire a higher number of multiple births and some females (individuals and maternal lines) can be more inclined to produce twins, the more likely reasoning in dairy cows is that feeding and the general health of herds of cows at specific times, can lead to a higher incidence of multiple births, where more than one fertilised embryo is retained over a full-term pregnancy.

For cattle, stature is a highly heritable trait and so if a tall male is bred to a tall female, the result is not just tall progeny but taller progeny. With increased stature comes higher bodyweight and a tendency for other traits to become more common. For example, as cattle increase in height rear legs tend to become straighter, sometimes too straight.

1.3 Bull selection

In the survey conducted, a substantial majority, exceeding 75% of participating farmers and herdsmen, conveyed satisfaction with the existing pool of bulls meeting the importation criteria.

Those that expressed a desire for a more extensive selection, acknowledged the limitations posed by the stringent criteria that bulls must meet to qualify for importation.

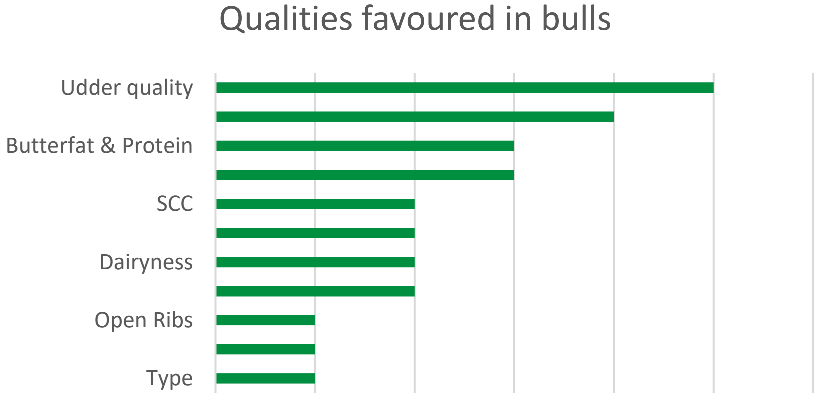
There is currently no genetic test that can prove 100% Jersey and most proof is based on the record of heritage. By having stringent rules on bull selection that promotes assurance on the pedigree of bulls that qualify, crossed with the historical Island families, Jersey Island are producing quality cattle that compare well with international Jersey populations.

Bulls are selected for importation based on internationally published performance data and subject to the following criteria:

- Minimum seven generations pedigree recorded ancestry in a recognised herd book.
- No known ancestor of any other breed.
- Homozygous for A2A2 milk protein.
- A non-carrier of Jersey Haplotype 1 (JH1)

The preferences among farmers when selecting bulls is centred around specific qualities, with udder quality identified as the current highest priority, followed closely by fertility. Other traits that were highlighted by farmers are provided in the table below.

Figure 1.3. Traits most favoured by farmers/breeders when selecting bulls



Weighting by number of positive responses.

The Dairy added that the traits most significant to the industry are ones that enhance animal welfare. There was anecdotal evidence that there has been an improvement in 'manageability', possibly associated with the integration of Danish bulls, which has had a positive impact on the well-being of the cattle. It being noted that the Nordic breeding indexes have placed a higher weighting on health traits for many years.

A standout feature of the Dairy's marketing strategy is that they are proudly able to say that their cows spend a significant duration, ranging from 7 to 9 months, outdoors, made possible by the robustness of the Jersey cow. A characteristic that underscores the breed's adaptability to varied environments and contributes substantially to the overall welfare of the Island herds.

When it comes to bull selection, there are a number of tools that are available to help make breeding decisions.

i. Profitable Lifetime Index (£PLI)
£PLI composes of a number of traits, each weighted by its relative economic importance and can only be used to compare animals of the same breed. Over a third of an overall £PLI score is accounted for by milk production, the remaining two-thirds comprise of health, fertility and survival and efficiency traits. The UK Agricultural & Horticultural Development Board (AHDB), who generate the indices for the Island population from the raw data collected on Island, suggest, when using £PLI as a tool, to select bulls with a higher value than the best cow in a herd, then to select for fitness traits, type and then calving ease for maiden heifers. (AHDB Breeding Briefs)

ii. Individual production indices
Individual production indices assess and quantify the production performance of individual animals. It takes into account the various production-related traits and are designed to identify the most productive and economically valuable cows in a herd. Some of the key components and traits commonly included are: milk yield, fat and protein content, somatic cell count (SCC), lactation persistency and fertility traits.

iii. Genomics
Genomic evaluation has allowed early assessment of individuals by taking young calves DNA to estimate their genetic potential. Unlike traditional pedigree index calculations, genomics can identify superior or poor traits that may not present as phenotypes. Genomics works by creating a reference population and identifying markers (SNPs) for traits in the DNA that are deemed poor or favourable. These are used to create a 'SNP-key', which can be used to evaluate individuals. (Genomics in the dairy industry | AHDB)

iv. Linear Assessment
Introduced to the UK in 1985, Linear Assessment scores 24 traits on their actual appearance on a scale of 1-9 which is combined into 5 composites to give an overall classification score. It is conducted by the Breed Society appointed classifiers for herds wishing to assess individuals' strengths and weaknesses and AI companies progeny testing their sires. All first calving animals are linear assessed and classified. (Classification Introduction | Jersey Cattle Society of the UK)

v. Triple A Score
The Triple A guide was developed in 1950 by Vermont Holstein breeder and classifier, William A Weeks. His study identified naturally occurring patterns in the way animals' body parts are formed and function together. He devised the 'aAa' system to include the 6 numbers in today's scoring. Triple A suggests that a cow's form determines how well she can function, including her will to milk, efficiency of feed conversion, calving ease, health, fertility, mobility and longevity, and that a uniform herd of balanced cows that are free from extremes is more profitable and are easier and

more enjoyable to work with. (What is aAa).* A majority of Jersey cows in Jersey Island are Triple A assessed.

**Whilst based heavily on common sense, in that for most traits any animal with characteristics towards the outlier curve of a typical bell-shaped curve should not be bred to a mate with similar characteristics, it can prove useful in modern breeding programmes when farms heavily rely on data from the supplying breeding company and other external agencies, rather than first hand knowledge of the bull selected for mating and its close female relatives. This is even more evident in a world of young bulls that are genomically proven, rather than being daughter proven. That said, there is little to no scientific evidence that the system is any more reliable than other methods due to there being no guarantee that a female lacking preferred characteristics will necessarily 'inherit' these from a male mate that exhibits these traits phenotypically.*

The farmers and RJA&HS were asked what emphasis they placed on five of the most common tools. The weight of use is displayed in the table below where the darker the colour indicates a higher emphasis of use.

	Do not use				Use heavily	
	0	1	2	3	4	5
£PLI						
Individual Production Indices						
Genomic Evaluation						
Linear Assessment						
Triple A						

As seen from the table, there are varying degrees of use for each tool when making breeding decisions which depends heavily on personal preference.

A secondary survey was issued, aimed at gauging the use of genomic evaluation and the way Jersey farmers use (or don't) the information they are provided regarding their animals. The responses have given insight into the landscape surrounding the integration of genomics into breeding decisions.

- Understanding and utilisation:

Farmers exhibited varying degrees of understanding regarding the genomic information received about their cattle. While all respondents indicated some level of knowledge, challenges were noted in comprehensively using this data to inform breeding decisions. Challenges cited included difficulties in navigating and interpreting the data, delays in delivery of results (especially since Covid) and issues related to the use of sexed semen; all of which hindered the full realization of genomics potential.

- Current usage practices:

Despite challenges, some farmers reported using genomic information to select for high-quality bulls, to address weaknesses in their herds, to check for relation (prevent inbreeding), or used it in conjunction with other breeding tools. A noteworthy remark was that some UK-based genomic facilitators supply results according to a USA production index, a format found useful by 57% of respondents.

- Future plans:

At present, the cost of these genomic tests is currently being subsidised by the Dairy as a part of the A2A2 project. When asked about their willingness to pay without the subsidy, farmers that responded to this second survey expressed varying levels of commitment, indicating a spectrum of financial considerations.

None	£10-20/ test	£21/30/test	£31-40/test	£41+/test

Farmers expressed plans for future use of genomics, suggesting a recognition of its potential benefits once challenges are addressed. These plans included improved understanding, addressing difficulties and optimising genomics in tandem with other breeding strategies.

1.4 Discussion on recommendations of 2018 Breeding Plan

In the 2018 report, Dr Bichard made recommendations on what he believed should be the steps for the years to come. Farmers and the RJA&HS were asked about their views on the recommendations, whether they agreed that they remained relevant and on progress on them in the past 5 years.

	Strongly Disagree	1	2	3	4	5	Strongly Agree
1.4a Continue to import semen							
1.4b Adopt an additional JHB rule							
1.4c Appoint a panel to review bulls							
1.4d Develop the health recording							
1.4e Devise the A2 milk production							
1.4f Identify a target for naturally polled							
1.4g Index-based selection for local conditions							
1.4h Reducing surplus calves							

a. *Continue importation of semen from international pedigree Jersey bulls in compliance with the current Jersey Herd Book rules.*

A consensus emerged from both farmers and the RJA&HS, affirming a collective stance in favour of the continued importation of international semen. However, a shared concern was expressed by both parties regarding the tightening of current rules governing importation. This apprehension stems from the perception that overly restrictive regulations could render the existing rules impractical, thus increasing the risk of inbreeding rapidly within the Island population. This emphasises the delicate balance required in formulating and evolving the existing importation policies that simultaneously safeguard genetic diversity and prevent adverse consequences associated with use of international genetics on the island population.

b. *Adopt an additional Jersey Herd Book rule to allow for non-qualification of animals that, whilst complying with all other herd book rules, exhibit characteristics that are not of the 'true type' Jersey breed according to the non-exclusive list in an appendix. This would define the permissible type-colour variations, markings, and perhaps size and weight.*

There was a general agreement regarding introducing a rule to exclude, or de-register, non-true type Jerseys. Farmers generally held the viewpoint that colour variations, particularly an excess of unusual white markings (e.g. a white head), could be indicative of an unknown breed within a bull's lineage, leading to its classification as a Jersey-Cross (JX). The importance of maintaining the breed as exhibiting 'Jersey' characteristics in its home island was recognised. The issue of size and weight emerged as a concern among farmers but was acknowledged as a consequence of using international genetics. The traditional Island Jersey, characterised by its short stature, has undergone a transformation due to the introduction of Danish, Canadian and American genetics, resulting in taller offspring. This shift has posed challenges in housing as the traditional stalls, designed for a smaller cow, face issues accommodating more modern, larger cows. Furthermore, the implications extend to the abattoir, where taller cows, by virtue of their increased height, also bear greater weight, potentially surpassing the weight restrictions and risk being excluded due to the abattoir equipment weight limit. The combination of these factors highlights the implications of the physical characteristics and logistical considerations within the Island herds.

The Dairy emphasized the significance of maintaining the distinctive image of Jersey cows on the Island. The commitment to preserving the recognizable features of the Jersey cow extends beyond the practical considerations; it is deemed crucial for the Jersey Dairy brand image.

To address this rule would mean that animals that do not fit the "true-type" Jersey phenotypes would not be eligible for registration, and subsequently any animals which exhibit characteristics not historically found in the breed would be de-registered necessitating their removal from the herd.

c. *Appoint a panel to review available bulls and monitor and record ineligible animals*

A consensus emerged from farmers and the RJA&HS, indicating a shared belief that this is an issue that needs to be addressed. Currently, the comprehensive understanding of a bull's lineage, particularly in identifying potential bulls that may contain other breeds in their ancestry, is attributed to David Hambrook. David's extensive investment of time in acquainting himself with pedigree lines uniquely allows him to identify lines that may include elements of JX. The collective concern expressed is in the potential loss of invaluable "cow knowledge" in the absence of David's expertise. To address this concern and comprehensively understand the intricate challenges faced by numerous potential bulls intended for use in Jersey, there is a recognised need for a panel that can collectively contribute to the nuanced evaluation of bull pedigrees. Such a panel could be constituted as an open forum of interested cattle breeders and would serve as a repository of knowledge and expertise, mitigating the risk associated with the dependence on a singular individual, and ensuring the continued and effective management of Jersey cattle breeding practices on the Island.

d. *Develop the health recording element of the existing herd recording programme to full 'Scandinavian' standards in conjunction with all interested parties.*

Farmers exhibited a range of opinions concerning the development of the existing health recording programme, for example, along the lines of the fuller programmes undertaken in the Nordic countries. A recurring comment against the proposition was the anticipated increase in data input requirements in relation to the value of the data collected from a small population and departing from the system used by the current main data processing partner the UK National Bovine Data Centre (NBDC). To fully achieve the benefits of a more advanced system, farms would likely be required to input more data. Despite the apprehension, there was praise for the Danish model in presenting their bull data, with recognition that a more sophisticated system would only aid cattle management.

The RJA&HS recognised the potential benefits of a more comprehensive health recording system, however highlighted the substantial associated costs at both farm and veterinary levels. It was emphasized that such an endeavour would require funding for a specific feasibility study, including a strategic 10-year plan and the designation of an allocated person for data entry. The recent integration of genomics into breeding practices has resulted in a rapid turnover of generations. In the context of a relatively small population, this accelerated generational turnover implies that any bull previously rated as exceptionally superior, or inferior, would likely have been succeeded by its sons, grandsons, and potentially great-grandsons by the time the daughters of the original bull reach an age where their own excellence can be defined.

As an example, and in most cases, a bull that proves to be exceptionally good for mastitis resistance or very poor for mobility issues due to soft hoof tissue tendencies, will highly likely no longer be available when these facts are known from the assessment of adult daughters in a local herd environment. For a population the size of that in Jersey Island, where herds tend to be behind the curve on the use of bulls offered by international supply companies, in part due to the restrictions on bringing in semen from any bull at the forefront of its otherwise short period of use; it is almost inevitable that such analysis would be garnered from other daughter populations elsewhere ahead of determining such facts here amongst the Island population.

This comparison of perspectives details the realities that need consideration surrounding the development of the health recording programme, incorporating the advantages, practical challenges and resource implications associated if this was to be implemented.

Jersey Dairy felt that from a customer's perspective, bespoke health monitoring programmes are viewed to be of significant benefit by promoting high animal welfare. Having previously looked at Somatic Cell Count (SCC) monitoring and advocated for the adoption of technologies such as Cow Manager to enhance health management practices, they are now exploring the possibility of artificial intelligence applications within the dairy sector.

A prominent feature contributing to the Island's cattle health status is its TB-free status. This is not only a testament to the overall health of the Island population but also a valuable asset to the industry. The Dairy recognises that a disease-free Island population enhances its appeal to customers and bolsters the integrity of its products. A concern raised by Jersey Dairy was regarding the absence of a contingency plan in the event of an illness outbreak. The recent and sudden loss of cattle from one Island herd served as a poignant example. While the affected farm has managed to replenish its herd from other farms with the support of the local dairy community, this serves as a stark reminder of the vulnerability of the industry.

The Dairy highlighted the imperative need for comprehensive contingency plans, particularly in the event of a disease outbreak that could impact multiple farms simultaneously. Drawing lessons from past experiences, it is imperative that there is proactive planning to safeguard the health and sustainability of the Island's cattle and dairy industry. At the time of publishing this report, a spreading outbreak of a new strain of Blue Tongue Disease (BTV 3) across an increasing area of Western Europe highlights the importance of such contingency planning, not just for the industry but across all local interested stakeholder groups.

e. Work with Jersey Dairy to devise a programme for the production of A2 milk.

The two major proteins in milk are casein and whey. Caseins account for about 80% of total protein in cow's milk. Casein comes in a few different types, one of which being beta-casein. Beta-casein makes up about 37% of protein in cows' milk and comes in a number of variants of which the most common are: A1 and A2.

A1 proteins are digested in the small intestine and is broken down into a peptide called beta-casamorphin-7 (BCM-7) which has been linked to stomach discomfort and symptoms similar to those experienced by people with lactose intolerance. The structure of the A2 protein is more comparable to proteins found in human breast milk, as well as milk from goats, sheep and buffalo. It does not produce the BCM-7 peptide when digested. (Kaskous, 2020)

Since the 2018 report, farms have been actively selecting for A2 and the island population % of A2 has risen in Jersey from around 45% of heifers born in 2008 being A2 to 87% of heifers born in 2023. The strategic objective is to utilise A2 as a key marketing tool for the dairy in the future once a high enough percentage A2 is achieved in the Island population.

The Dairy has been pleased with the progress made toward establishing an A2 population on the Island. Recognising the delicate balance between advancing A2 genetics and maintaining milk supply, the Dairy acknowledges that rapid progress could potentially compromise the latter and is mindful of the challenges faced by Island farmers (citing the recent and devastating loss of cattle from an Island herd). A2 would place another value on Jersey milk and while A2 milk has not yet gained substantial popularity in Europe, there has been significant growth in the sales of lactose-free milk. Driven by the misconception around A1 intolerances, the belief is that, as education around A1 intolerance expands, A2 milk is likely to gain traction.

Despite the concerted effort towards 100% A2, farms have expressed that they are reluctant to lose good family lines if they have a cow that's A1. Selecting for A2 bulls also meant that the pool of bulls to choose from was reduced, and the risk of inbreeding became a threat once again (Scott, 2023). The prevailing sentiment among farmers is a commitment to continue breeding from these lines, with the intention of progressively transitioning to A2A2. This approach reflects a strategic and phased transition, where the desire to maintain valuable genetic lines take precedence over an immediate shift away from A1 cows and considers balancing genetic progress with the preservation of valuable familial traits within the Jersey Island population.

Another complication presented was that the A2 brand is owned by a New Zealand company, meaning that the Dairy will unlikely be able to market the milk as exclusively A2. To overcome this, when a high enough percentage A2 is achieved in the Jersey population and the Dairy is ready to utilise the A2 in its marketing, it is likely that it will be promoted as "predominantly A2".

f. *Investigate the feasibility of adopting a target for the Island herd to become naturally polled.*

There was a varied response from farmers regarding establishing a target for naturally polled cattle in the Jersey population. Those that recognised the potential welfare benefits of naturally polled cattle, while considered it advantageous, nonetheless ranked it low priority. Their apprehension centred around concerns that if they were to start actively promoting polled traits, they could inadvertently restrict the number of bulls available for use in Jersey and therefore increase the risk of inbreeding, or reducing rates of improvement in other traits. Some farms have used bulls that are naturally polled; however, it was stressed that the polledness factor was not a primary consideration when selecting these bulls.

The stance of the RJA&HS mirrored that of the farmers, emphasizing that if the concept was to gain traction internationally, then polledness would be integrated into the Jersey population by default.

g. *Arrange for an AHDB-Dairy breeding specialist to conduct a discussion with herd owners on index-based selection for local conditions (perhaps jointly with Guernsey owners).*

While there was some interest in creating an index-based selection for local conditions, both the Society and many farmers who felt it would be beneficial, shared reservations regarding the efficacy of combining such an index with Guernsey, especially considering they have their own breed. Additionally, there was some concern that the Island population would be too small for this to be deemed feasible, especially given the potential for each herd within the Island to have their own unique focuses and priorities. The overall consensus was although it would be interesting to have a discussion around the possibilities of this, it is unlikely to be achievable at this point in time. In order for the discussion on this point to progress, an introductory report has been commissioned, utilising the UK experienced company AbacusBio, based out of Edinburgh University's Innovation Centre. AbacusBio are the company behind the Spring Calving and Autumn Calving variants of the Profitable Lifetime Index, which is the primary index presently used throughout the UK's dairy industry.

h. *Continue to explore all possible ways of reducing, or finding a market for, the number of calves not required for herd replacement.*

There were varying levels of agreement on the continuation of exploring ways to reduce the number of surplus calves. Despite disparities in opinion, there was a unanimous acknowledgment that addressing the matter is imperative. Concerns arose from prior efforts, particularly the beef project, which demonstrated initial efficacy but appears to have plateaued in terms of progress. The challenge stemmed from the lack of a consistent avenue for beef calf exportation and a local market saturated with limited consumers who are willing to pay the premium required to offset high costs of rearing on Island.

The most apparent solution identified for curbing surplus calf numbers is to cross Jerseys with beef cattle, most commonly used in Jersey is Aberdeen Angus. However, practical constraints such as insufficient grazing land, limited barn space, and the associated costs of importing additional feed, managing excess slurry, veterinary expenses, the potential for cattle to outgrow the local abattoir specifications, and the financial implications of exportation, pose formidable challenges for farms. While recognising the avenue of beef crosses as a means to reduce surplus calves, there should be a concerted effort to avoid making beef production more financially rewarding than dairy production. The overarching goal is to ensure the dairy sector remains economically viable and competitive, even as strategies are implemented to address challenges related to surplus calves.

In light of these hurdles, several avenues warrant exploration. The increased utilisation of sexed semen to selectively produce heifer calves for stock replacement has already gained traction. Exploring options such as extended lactation periods present another avenue for investigation. Additionally, the pursuit of consistent and reliable export routes, whether directed to the mainland UK or St Malo for subsequent European export, emerges as a crucial area for further research.
The Dairy has harboured longstanding concerns about this issue and expressed apprehension about the future. A key point of contention is the need for greater confidence in the use of sexed semen, a technology that holds promise in addressing the challenge of surplus claves. To encourage farms to retain calves, the dairy suggested the implementation of incentives, such as covering the cost of registration. This approach aims to reward farms actively engaged in mitigating the issue with the intention of creating a unique herd that has a valuable export market for the animals.

1.5 Current Requirements for Pedigree Registrations and Licensing

There was an overall agreement that the current licencing requirements for pedigree bull registration should be upheld. Farmers emphasized the necessity of maintaining high standards to safeguard against inadvertently breeding defects into the Island herd.

Whilst an important aspiration, the RJA&HS noted that very few other herd books currently prioritise some of the traits that the local Herdbook would have considered important to record historically. For example, very few other Herd books note the characteristic of a Twisted Face, possibly because they are rarely seen in other populations. Due to the historic closed local herd, such undesirable traits were very closely monitored. Anecdotal evidence records the local levels of facial deformities to have been as high as 10% in the female cattle population, even with these regulations in place.

This was also largely attributed to the fact that most males are either used nationally/internationally through AI. In these cases, parameters beyond hereditary defects, such as the inability to produce semen that freezes effectively, become the key considerations. Additionally, bulls that are only used locally on a single farm, as sweeper bulls, are likely to have limited impact outside of those specific herds.

Farmers, generally erring on the side of caution, tend to prefer pedigrees extending to at least seven generations. However, there was acknowledgement of potential challenges arising from a diminishing pool of available bulls in the future. This could prompt a review of how to best preserve the status of the Island herd, in light of circumstances pertaining at that time, which might, for example, include advances in genetic testing. Some farmers expressed openness to future analysis and potential adjustment of this rule to ensure that the Island does not lag behind genetically, due to an overly restrictive breeding criterion.

The RJA&HS highlighted that it has been several years since the original intention of offering detailed pedigree documents, and indicated a broader trend among other breed societies, where data is now predominantly managed and accessed online. In this context and as the primary importer of genetics, Jersey Island Genetics conducts their research, and the RJA&HS subsequently confirms pedigree status according to the Jersey Herd Book rule. This observation emphasises the contemporary shift toward digital platforms and the possibilities to employ modern technology for pedigree information and verification.

1.6 JX Bulls

A prevailing majority of farmers expressed reluctance towards the introduction of JX bulls on the Island. JX being the classification grading by which US Jerseys indicates the generation count from an unknown or non-Jersey breed animal in the pedigree (US Jerseys). The Jersey cow is regarded as an iconic representation of the Island and, as the breed's place of origin, should not be perceived as less pure than their counterparts worldwide. There is prominence on the breed's cultural significance and its integral role in the Island's heritage. Farmers stressed the importance of considering public opinion, given that the breed holds a substantial place in the collective identity of the Island.

Contrastingly, a minority expressed willingness to consider the use of JX bulls, realising the potential for increased yield and vigour within the Island population, subsequently enhancing profitability. The perspective surfaced that the use of JX may warrant re-evaluation in the future; particularly as the human population globally increases, as will the heightened demand for dairy products. It may also be the case that in time the number of qualifying bulls available for use in Jersey have greatly reduced, and that it could put the Island at a global disadvantage to not consider using JX.

The Dairy's message to consumers emphasises the purity of its Jersey cows. The message underscores the recognition of the inherent value associated with being a purebred Jersey herd, a distinction that translates into a premium for their products. This branding strategy aligns with consumer preferences for authenticity and quality, contributing to the industry's market positioning and potential for premium product differentiation.

From the RJA&HS stand point, the JX label has been a useful tool for identifying bulls that do not qualify for Island use. However, the RJA&HS underscored the inevitability of widespread infiltration of JX stock into global pedigrees within the next 5-10 years. The fear is that this infiltration could lead to a reduced number of qualifying bulls and thus increase inbreeding within the Island herd during this time frame (causing further problems, such as reduced fertility, etc.) Reference was made to the impact seen in New Zealand bulls on the Australian Jersey gene pool, highlighting the broader implications of the global spread of JX genetics. The RJA&HS advocates a proactive approach, utilising genomic research, to address these concerns promptly rather than deferring the issue for another 5-10 years. The urgency stems from the potential long-term consequences on the Island population's genetic diversity and overall health.

1.7 Breed Improvement

The breed improvement program has sparked several initiatives, with prominent suggestions emerging from farmers. A primary interest centres on exploring the potential for producing Island bulls specifically for export and use within the Jersey population. The idea of gauging global interest in cow families from the Island would be essential for this to be feasible. This concept aligns with the broader aim of positioning the Jersey cattle population on the global scene while creating a source of income for farmers producing high end bulls. An additional proposition involves revising the idea of establishing a Channel Islands AI centre, or alternatively, exploring the feasibility of drawing semen in Jersey with the availability of mobile equipment. This requires a more detailed investigation.

Several farms indicated a desire for a more user-friendly database for analysing genomic data. Which, as the technology develops, the userbase will inevitably develop alongside; but likely incurring a cost to farmers for the service. The impressive achievement of genomically profiling the entire Island population highlights the potential value of this data. However, a more readable and user-friendly interface would facilitate a more effective interpretation of the data, aiding farmers in making informed decisions when selecting animals for breeding.

Another noteworthy suggestion from both farmer and the RJA&HS involves establishing breed goals for the herds. These goals incorporate measurable and reportable production traits such as milk yield, butter fat and protein content. Additionally, goals could extend to encompass other traits, albeit in less detail, and could include factors related to management practices (e.g., calving indexes, profit per litre) and public perception (e.g., % polled calves and mobility scores). Establishing and reporting on these goals provides a framework for enhancing breeding practices.

2. Historic actual performance trends of the Island herd

The performance data for the Island Jerseys has been sourced from the National Bovine Data Centre (NBDC), the lactation summary can be found on their website. The figures included in this data do not correspond to the number of animals registered, and excludes those who may have ended their lactation below 200 days. It does provide a guide to the trend in the lactations recorded. *Figure 2.1* and *2.2* display those trends for the average milk yields and component percentages from 2008 to 2022. The graphs reflect the data from *Table 1* found in the appendix.

Milk yield has been one of the most noticeable improvements within the Island herds since the introduction of international genetics. The average annual milk yield between 2008 and 2022 has increased by an impressive 52.6%, with the Island Jerseys now producing just shy of 7,000kg per cow annually. This progress has accumulated to an average annual increase of 3.76% since 2008.

In *Figure 2.2*, the trends of average fat and protein percentage are shown. The fat percentage in milk shows a total increase of 6% since 2008. The percentage of protein has remained steady around 3.7%, with marginal annual fluctuations. The overall protein percentage has experienced a modest increase of 0.7% since 2008.

Figure 2.1

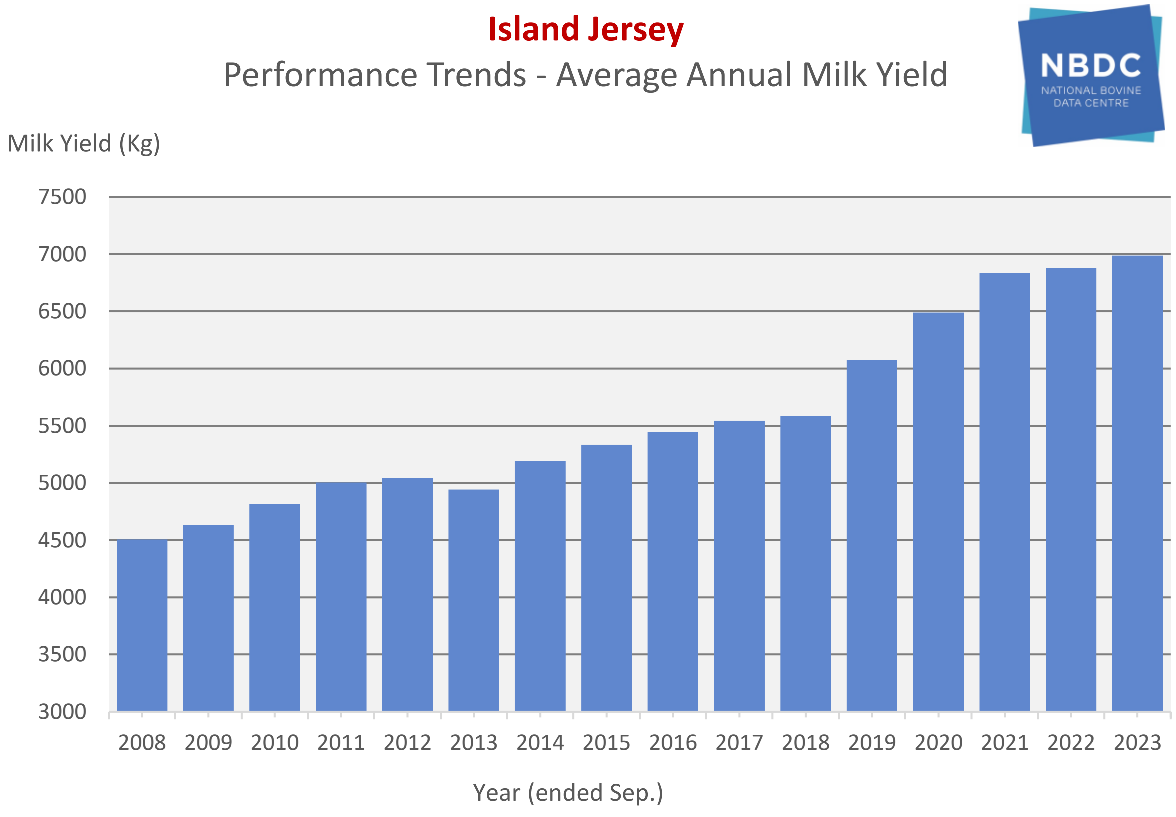
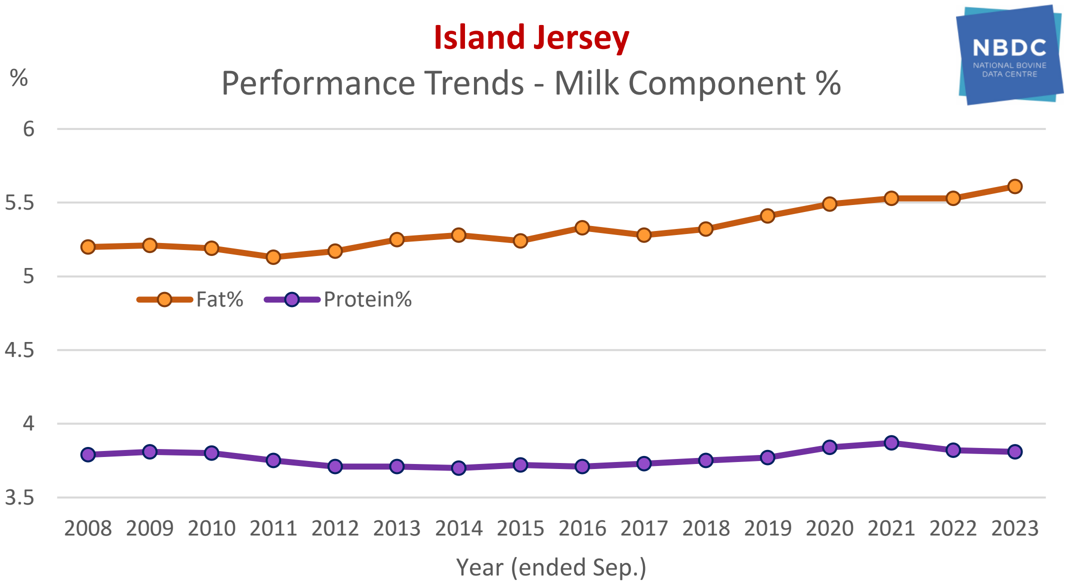


Figure 2.2

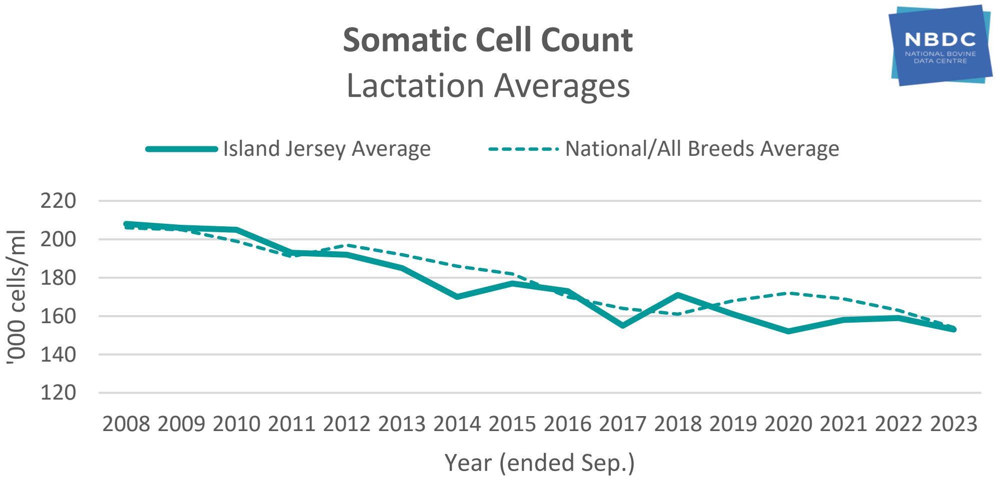


Somatic cells are naturally present in milk and are used as an indicator of udder health and milk quality because of their involvement in protecting the mammary gland from infection. *Figures 2.3* and *2.4* show the annual averages for the Somatic Cell Count (SCC) and the Calving Intervals (CI), shedding light on the health dynamics of the Island population.

Since 2008, the average SCC for Island Jerseys has seen a total decrease of 23.5%, which is an indication of how much improvement there has been in animal health in the recent years. The graph also provides comparative analysis against the averages of all other breeds in the UK, which have followed a similar decrease trend since 2008.

It is important to understand that there are multiple factors that influence udder health, and consequently SCC levels, and while it isn't possible to attribute the decline in Island SCC solely to the relaxation of semen import restrictions, it is plausible that the integration of international genetics and the resultant diversification of the gene pool in Jersey, has played a pivotal role in contributing to the overall health improvement observed in the Island population.

Figure 2.3

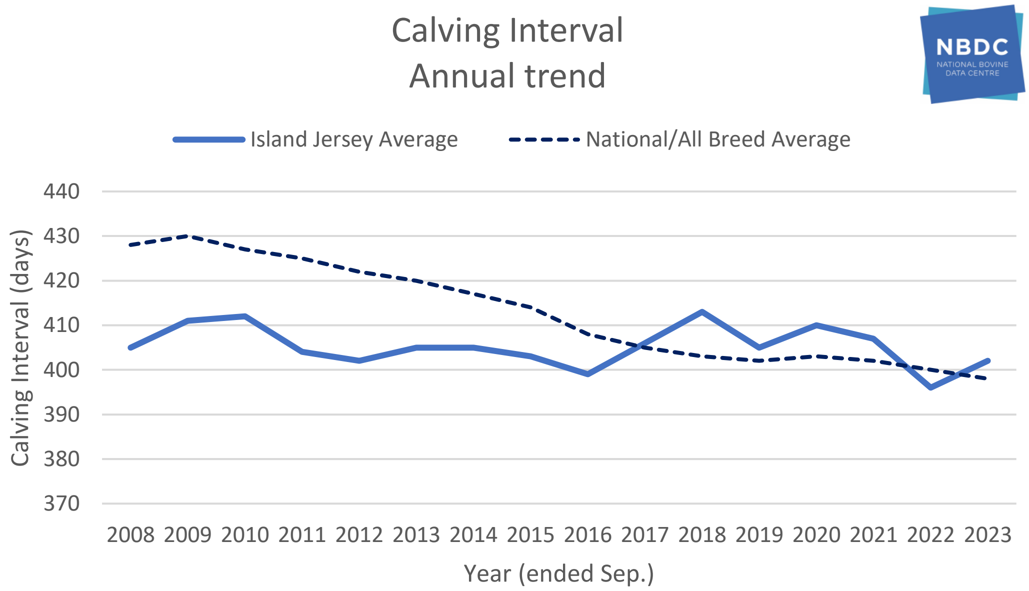


The calving interval (CI) is the period between successive calf births from the same cow and is a significant key metric in dairy cattle management. Generally, the optimal CI for dairy cattle has been estimated around 365 days**.** Reducing calving intervals minimises work and increases profitability by ensuring cows spend maximum production time in the milking parlour and minimum time in the dry pens. CI is known be influenced by several factors including: the reproductive health of the cow, the effectiveness of breeding programs, nutritional management, environmental conditions, and the genetic predisposition of the breed

The CI annual average for the Island Jerseys has demonstrated stability over the years, peaking at 413 days in 2018 and, as per the most recent records of 2022, at its lowest of 396 days, although climbing slightly to 402 days in 2023. This might be a contributing factor to the perception that fertility has declined. This trend contrasts the broader trend observed across all-breeds, where the CI has consistently decreased since 2008. The overall average decline for all-breeds stands at 30 days (peaking at 430 days in 2009).

While the Island Jersey herds have demonstrated more favourable CI averages compared to the all-breeds counterparts, their rate of improvement appears to be less pronounced. This prompts a deeper examination into the breeding and management practices specific to the Island Jerseys, exploring the factors that influence their calving intervals and how they can be improved to service the Jersey farms economically.

Figure 2.4



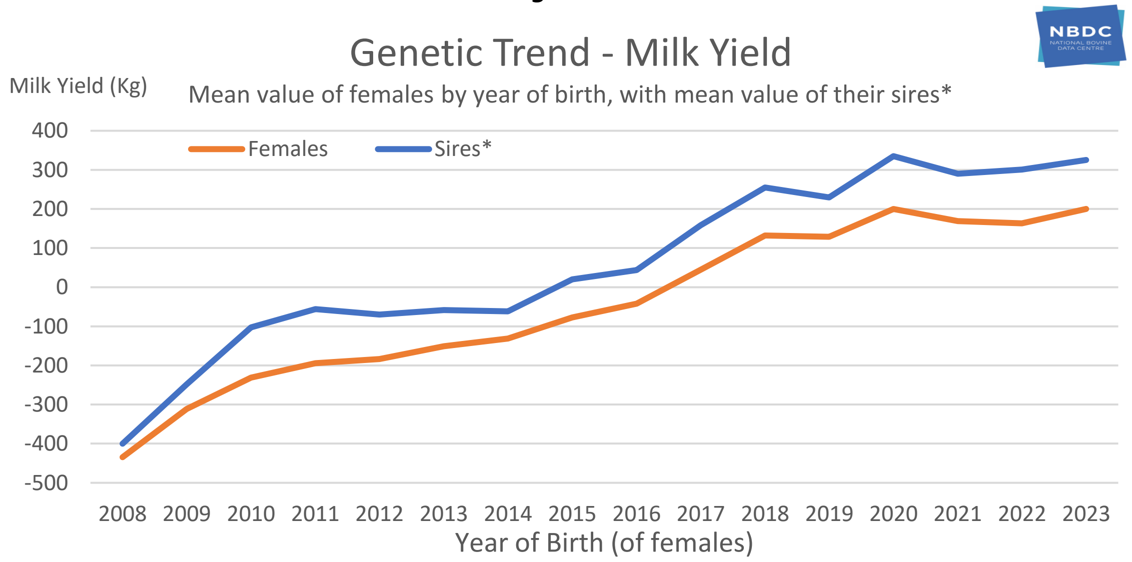
3. Genetic trends of the Island herd

Figures 3.1, 3.2 and *3.3* offer an overview of the annual average trends of the Island milking females against the averages of their sires. These figures are based on the Predicted Transmitting ability (PTA), a metric that quantifies the potential for specific traits to be inherited by offspring, providing a numerical basis for trait heritability.

Prior to importation, the PTA of milk yield for milking females and their sires, followed very close trend lines, exemplifying a synchronicity in trait transmission potential. *Figure 3.1* refers to this alignment, with cows milking in 2008 and 2009 exhibiting a similar pattern.

In 2010, a pivotal juncture is observed as the first daughters born to international sires enter the milking rotation, resulting in the most pronounced separation gap between the trend lines. As the Island milking population improves, the gap between the females and the sires closes, signifying the positive trajectory in enhancing the population's genetic potential as the influence of international genetics take root. Despite this convergence, it is noteworthy that the sires' average remains consistently higher than that of the females, proving the persistent impact of international genetics on shaping the genetic landscape of the Island Jersey population.

Figure 3.1



Similar trends are seen for PTA fat % and protein % in *Figure 3.2 and 3.3*. In 2010, when the first daughters sired by international bulls are included in the data, there is the most noticeable difference between the Island females and their sires. This divergence again signals a critical phase where the genetic influence of international sires begins to shape the hereditary potential of these traits and as subsequent generations of Island females inherit the improvements, the genetic gap gradually narrows.

This annual increase seen in the sires is fairly consistent until 2020 where there is a sudden drop in both fat % and protein %. This appears to have little effect on the annual average of the females; however, it does almost completely close the gap between females and their sires from there onwards.

Figure 3.2

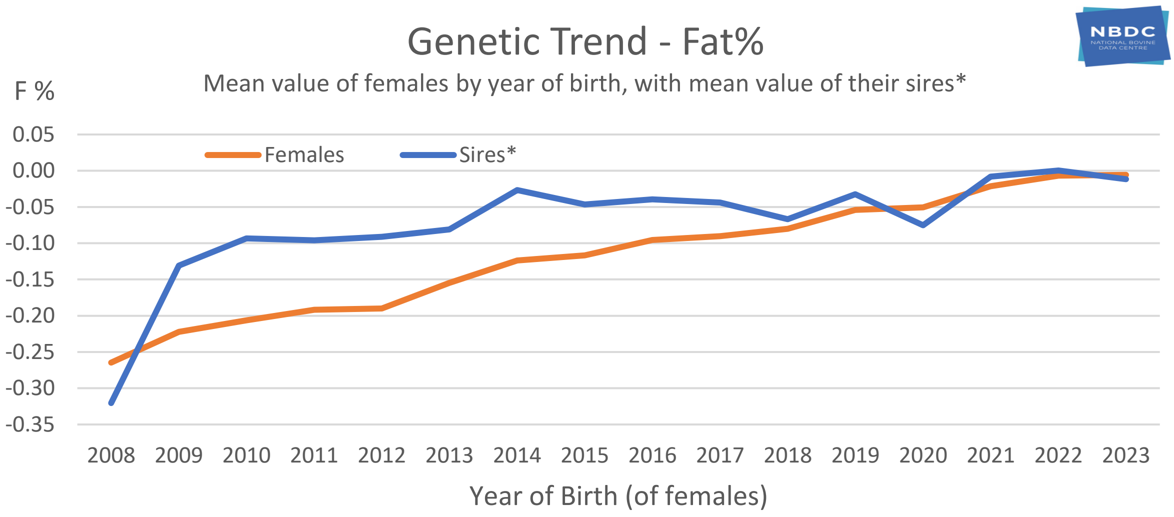
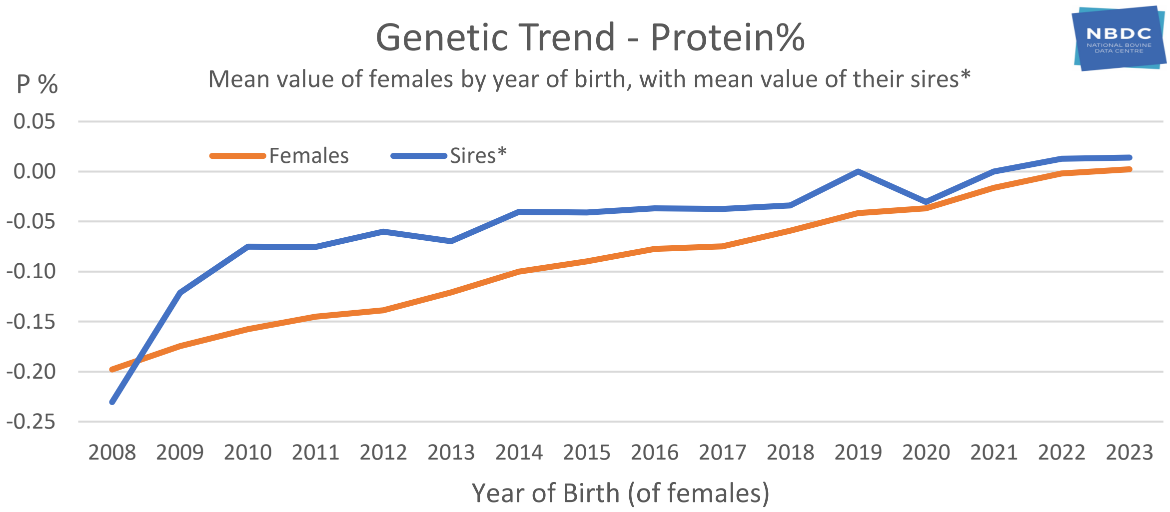


Figure 3.3



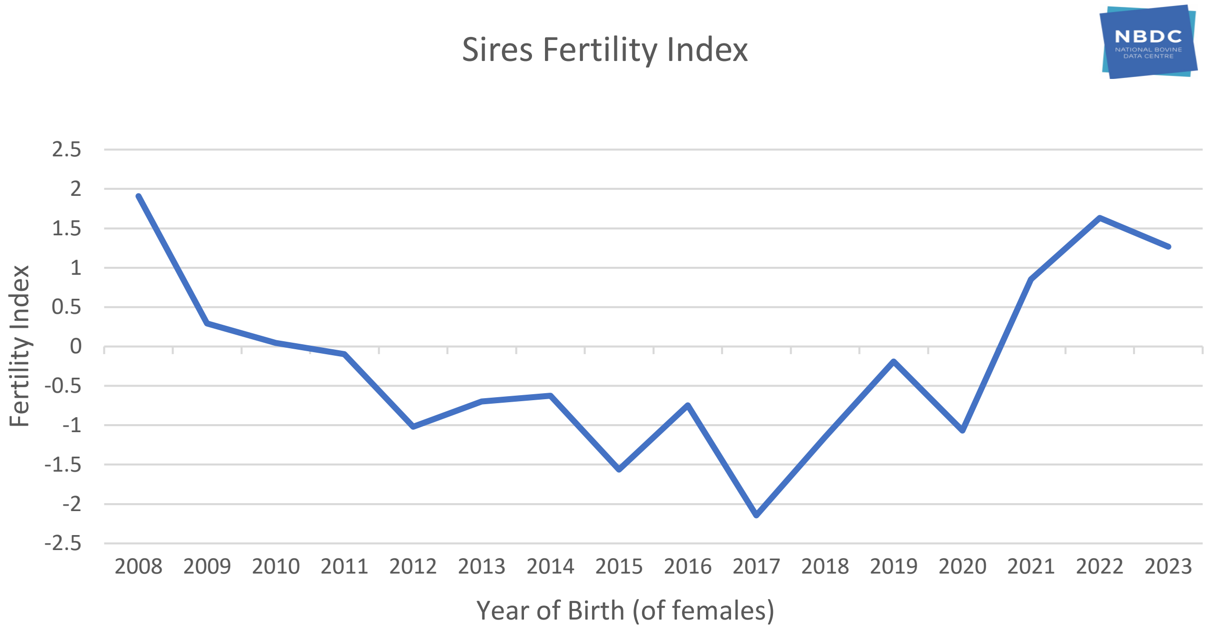
The Sires fertility index, *Figure 3.4*, reveals a very staggered trend. From 2008-2012 there is a steady annual decrease, however, from 2012, the trend becomes more staggered, with alternating years of fluctuation. And then, from 2020 onward, a stark increase.

During this review, farmers had expressed their desire to improve fertility on the Island and often selected for high fertility traits when choosing bulls. The AHDB bull fertility index combines a variety of measurable traits from daughters including:

- Calving interval
- Non-return rate at 56 days
- Body condition score
- Milk yield at around the time of insemination (110 days)
- Days from calving to first insemination
- Number of inseminations needed to get a cow in calf

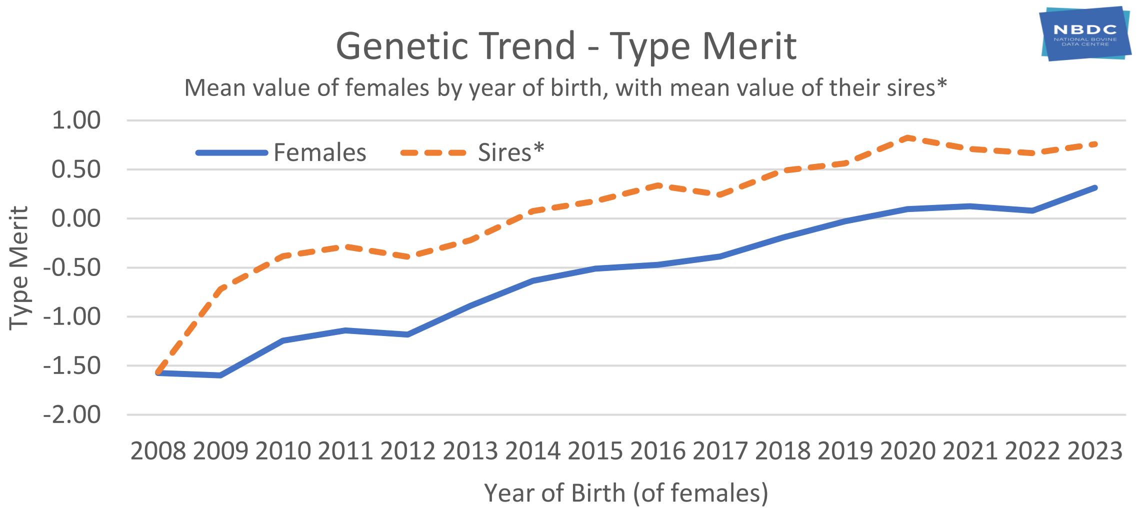
While modern dairy farming has seen a rapid integration of digitized herd management systems, offering swift improvements in herd fertility through enhanced animal management, the long-term impact of selecting bulls with high fertility traits becomes evident in generational influences. The lasting effects of such choices underscore the economic viability of prioritizing high fertility.

Figure 3.4



Type Merit (TM) identifies animals with outstanding overall genetic merit based on their daughters' scores for feet and legs, udder and body conformation. Following similar trends to the milk-related metrics, *Figure 3.5* depicts the drastic improvements in conformational traits since 2008. This generational transmission of enhanced structural characteristics is a testament to the impact of selectively introducing high TM bulls into a breeding program, and the daughters of those bulls not only mirror the improved conformational traits but also contribute to the perpetuation of these advancements in subsequent generations.

Figure 3.5

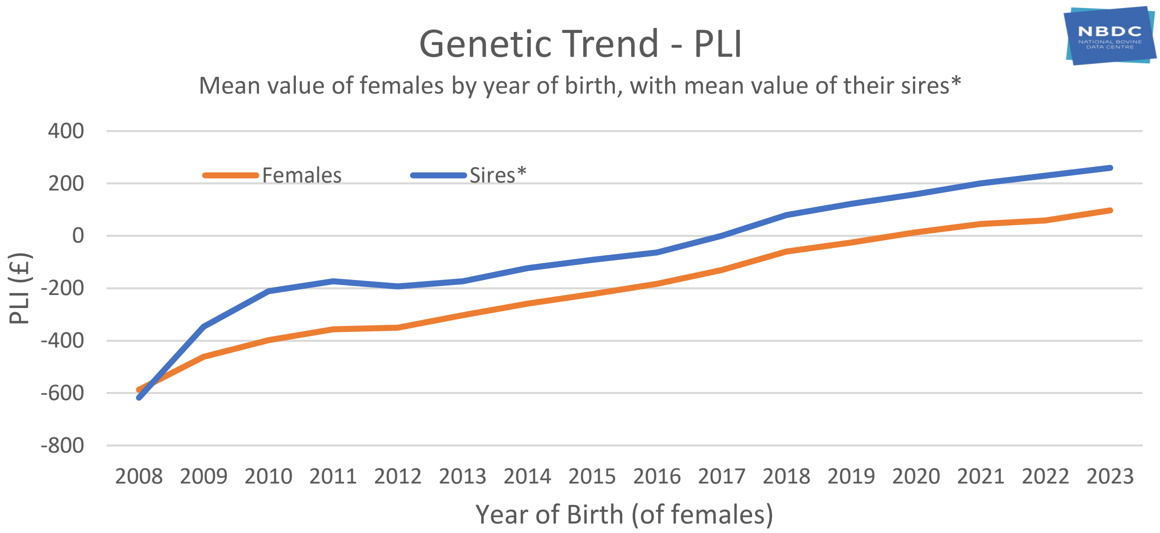


Profitable Lifetime Index (£PLI) figures are calculated using around 32% production traits and 68% fitness traits, reflecting an understanding of a bull's potential impact, considering its ability to enhance milk production and the overall fitness and longevity of its progeny. The value represents the additional profit a high £PLI bull is expected to return from each of its milking daughters over her lifetime, compared with an average bull of £0 PLI. It is important to recognise that while £PLI is a valuable tool, the profitability of a herd is influenced by various other factors beyond genetics.

Originally developed for Holstein, each breed is now compared against its own genetic base with own breed variation, and a popular tool used in combination for sire selection among Island Jersey owners. Prior to 2008, the sires used on the Island were exclusively Island bred bulls, and with limited genetic development, there was limited progression of £PLI.

In 2008 £PLI for both the females and their sires were very similar, and against the current baseline, relatively poor. Again, it is seen through the trendline how the influence of international sires has benefitted the £PLI of the Island population. As traits improve and maintenance costs decrease, the £PLI shows rapid advancement. *Figure 3.6* shows over the 5 years since the previous review, the average gain has been £38/year.

Figure 3.6



4. Looking Forward

4.1 Fertility

Due to the intense selection for increased milk yield in dairy cattle, all breeds have seen a decline in fertility among other traits. Extensive research has been conducted on fertility issues in dairy cattle, revealing a negative correlation between production and fertility due to the energy demands associated with both traits.

Despite fertility traits being considered to have low heritability, the presence of sufficient genetic variation offers avenues for genetic improvement through selection (Kgari, 2021). Longevity in dairy cattle is defined as the total lifespan of a cow, or as the length of productive life. Greater longevity is associated with lower replacement costs, a higher average milk production and a lesser requirement for replacement heifers (Nascimento, 2023), thereby saving on rearing costs and associated labour. Moreover, fewer replacement heifers are needed, reducing the demand for breeding stock and allowing farmers to focus resources on other aspects of herd management. Establishing goals to enhance average longevity aligns with both economic and operational objectives, promoting sustainability and efficiency within the Island cattle industry.

The calving interval of dairy cattle has been estimated at best around 365 days, (optimal fertility is a necessity for this to be achievable). Two major challenges associated with fertility have been identified as failure of fertilisation and early embryo death, often down to poor quality oocytes and inadequate uterine environments. To address these challenges, two primary solutions have been adopted by many breeders and farmers globally.

Firstly, embryo transfer has the ability to reduce the effects of poor oocyte quality development during the first seven days after ovulation in a repeat breeder and can be considered as an option to increase conception rates in dairy cattle alongside being able to breed from both high-quality females and males (Nowicki, 2021).

Secondly, the adoption of sexed semen presents several advantages, including providing the opportunity of using fewer and genetically better cows for replacement heifers. However, the conception rates when using sexed semen is usually lower. This has been attributed to the stress associated with sorting the semen and the damages to the spermatozoa in the process, and conception rates have been measured at approximately 60-90% of conventional semen (Loggan, 2019). The benefits of using sexed semen have been numerous. Sexed semen has been found to expose a sire's fertility which can be missed when more sperm cells are present, produces products that are economically beneficial for dairy farmers by obtaining progeny of the desired sex, optimise the herd by heifers' replacement and minimise the risk of introduced diseases caused by natural mating. (Boneya, 2021).

The RJA&HS is undertaking research on semen quality of imported bulls by deploying technology to measure both degree of sperm motility and persistence, by bull and collection batch. This will assist with identification of the best bulls and batches of their semen to use, thus improving fertility.

4.2 Introduction of cross bred bulls into international pedigree herd books

From this review it has been made clear that from all perspectives, as of current, it is not in the best interests to be introducing cross bred bulls into the Island population. It has been abundantly clear through data and physical appearance that the relaxing of semen import restrictions in 2008 was monumental for the development of the Island population and the expansion of gene pool has been beneficial for health and production traits. In recent years, it has become increasingly obvious that the pool of bulls that meet the criteria for import to Jersey has been slowly declining. The accidental and deliberate crossing of pedigree animals has been growing globally as farms strive to achieve higher yield and better production of product, and the benefits of cross-breeding has been reported to have health benefits for the animals, as well as providing more choice on selection when it comes to breeding.

The current pedigree status of the Island's animals holds a high value to both breeders and the Island dairy. It has given them the ability to selectively breed in traits rapidly, such as the A2 gene that has the potential to target specific markets in the future, and provides the recognition globally as the place where the breed first developed. In the future it may become necessary to reconsider the Jersey Herd Book licencing regime to avoid regression by inbreeding of the Island herd.

To plan for the future, there needs to be a strategy in place so that pedigree bulls chosen can be verified without total reliance on individuals' knowledge. One option that was recommended in the previous review, is that a panel needs to be established; this has also been addressed in this review, with an emerging consensus that a panel would be beneficial. Additionally, using artificial intelligence technologies to trace lineage may be possibility in the future so that breeders don't have to rely on individuals' knowledge of pedigrees.

4.3 Genomic testing

Jerseys cows have been reported by global organisations to have the highest rate of 'staying in production' and the lowest rate of removal, attributed to their reproductive performance, resistance to disease and injury, lower incidences of mastitis and fewer leg and feet problems. In 2015 the National Dairy Herd Improvement Association reported that the proportion of Jerseys continuing in production was 72.3%, whereas for all other breeds and cross breeds, the proportion was 66.9%, highlighting the robustness of the Jersey cow (Little, 2021). Along with type traits related to udder and foot health and their relationship with milk production and locomotion, inbreeding also has a substantial influence on longevity. Performance in dairy cattle has been directly affected by inbreeding depression due to increased homozygosity, resulting in increased culling due to low production, longer calving intervals, lower conception rates and higher SCC.

It is important for the Island herd to maintain a genomic testing programme for a number of clear reasons:

- To assist with selection of breeding stock.
- To add to the genomic data base of the breed on an international basis.
- To support any future initiative to market breeding bulls.
- To maintain the A2A2 milk protein goal.

4.4 Inbreeding

Levels of inbreeding can be measured both on an individual basis and at a population level. This is expressed as an inbreeding coefficient (COI). The inbreeding coefficient is a formula developed to determine how closely bred genetically animals are, to themselves. It is not directly a measurement of animals to herd-mates, for example, and will not change if the animal moves from a herd of origin, where it is closely related to herd-mates, to a herd where it is unrelated to new herd peers. The higher the percentage, the greater the inbreeding, and therefore related risks for that animal.

Increased inbreeding within a population, and a breed, results in a loss of genetic variation. This can result in a reduction in the scope for genetic improvement, and can also have metabolic effects, e.g. fertility depression, along with a reduction in a population's ability to respond effectively to disease threats, making them more vulnerable to epidemics and outbreaks. With pure-bred mating, inbreeding is unavoidable, but it has allowed for the development of pedigree breeds. By minimising inbreeding, breeders mitigate the risk of genetic disorders and maintain vigour within a cattle population.

An inbreeding coefficient can be calculated either using pedigree data (*Fped*), which analyses pedigree relationships including co-ancestry, or genomic data which analyses genetic runs of homozygosity on alleles, (*Froh*). Whilst the results from the two methods will differ, as genes from the same two individuals are not inherited equally by offspring, the results are expressed as a percentage and can presented together.

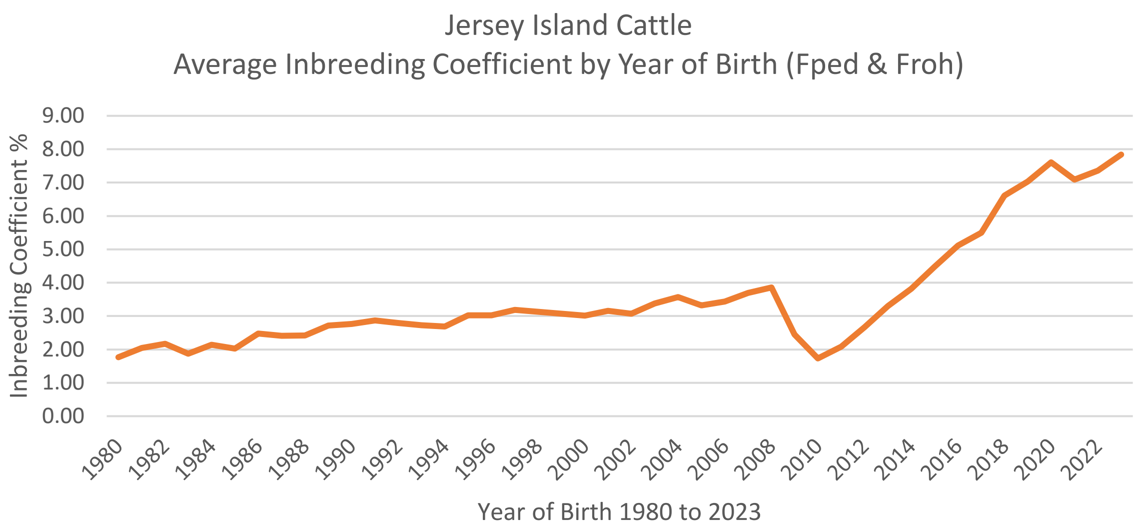
There has been considerable research undertaken comparing inbreeding in the Jersey breed to that in the Holstein breed. A study of Nordic cattle indicated that the Jersey breed has a higher level of inbreeding (18.32%) than the Holstein (12.62%), although how that inbreeding has occurred differs (Tenhunen, 2024). The Jersey breed, originating from a small, isolated, population in the Island of Jersey had a higher rate of short ROH, indicating 'ancient' inbreeding whereby over the centuries the small population shared common ancestors and any deleterious effects of inbreeding were mitigated over time.

'Ancient' inbreeding can have a positive, or neutral effect, in 'fixing' beneficial characteristics and is demonstrated by the higher survival and lower involuntary culling rates of the Jersey breed. Recent inbreeding, demonstrated by long ROH, can be problematic, e.g. increased risk of culling or decreased fertility, and can result from 'genetic bottlenecks' whereby a few, often related, top sires are widely used by AI across the population.

These results were supported by genetic research into the population structure of Island Jerseys with other Jersey populations and Holsteins (Huson, 2020). In this report, inbreeding coefficients or *f* values, ranges from negative one, representing an excess of heterozygosity, to positive one, representing an excess of homozygosity or inbreeding. Zero denotes Hardy-Weinberg equilibrium. The average inbreeding coefficient per breed was lowest in Holstein (f = -0.004) and highest in Jersey (f = 0.166) cattle. An evaluation of Island and U.S. Jerseys show *f* scores ranging between 0.1- 0.2 yet achieving significant variation using a T-test comparison with a lower *f* score within the U.S. population (JE_ISL = 0.194; JE_USA = 0.147).

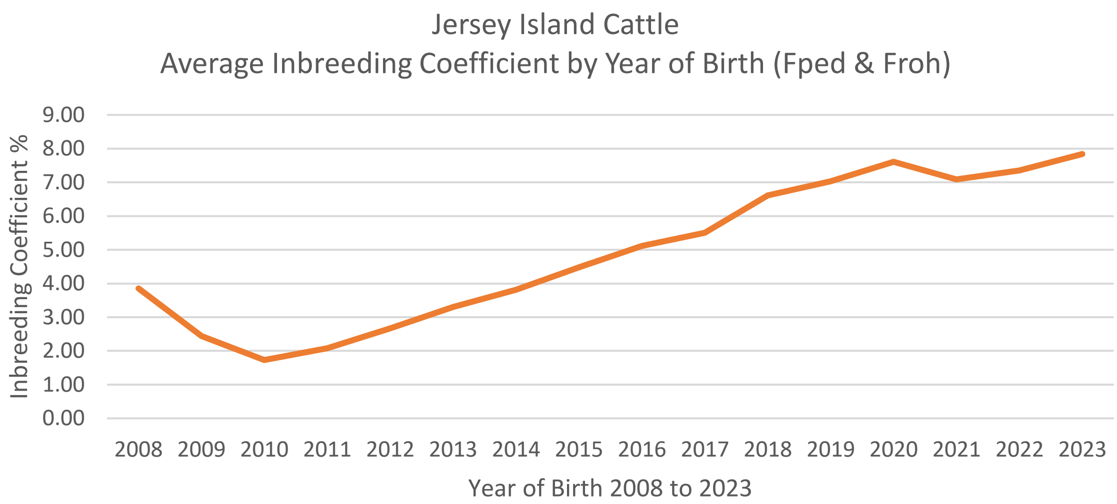
Historically, whilst Jersey Island maintained a closed population, and utilised a wide range of bulls often from within individual herds, levels of inbreeding were low (Chikhi, 2004), however as selection pressures increased as a result of the decline in the number of herds, thereby reducing the number of breeding decisions, along with the introduction of breed improvement schemes designed to promote breed development, levels of inbreeding began to rise. Pedigree data from 1980 to 2008 indicates an average inbreeding coefficient (*Fped*) more than doubling from 1.76% to 3.85%, see Figure 4.1.

Figure 4.1



When international sires were introduced in 2008, the average COI% dropped almost immediately from 3.85% in 2008 to 1.73% in 2010. Since then, there has been a steady growth to 7.84% in 2023, Figure 4.2.

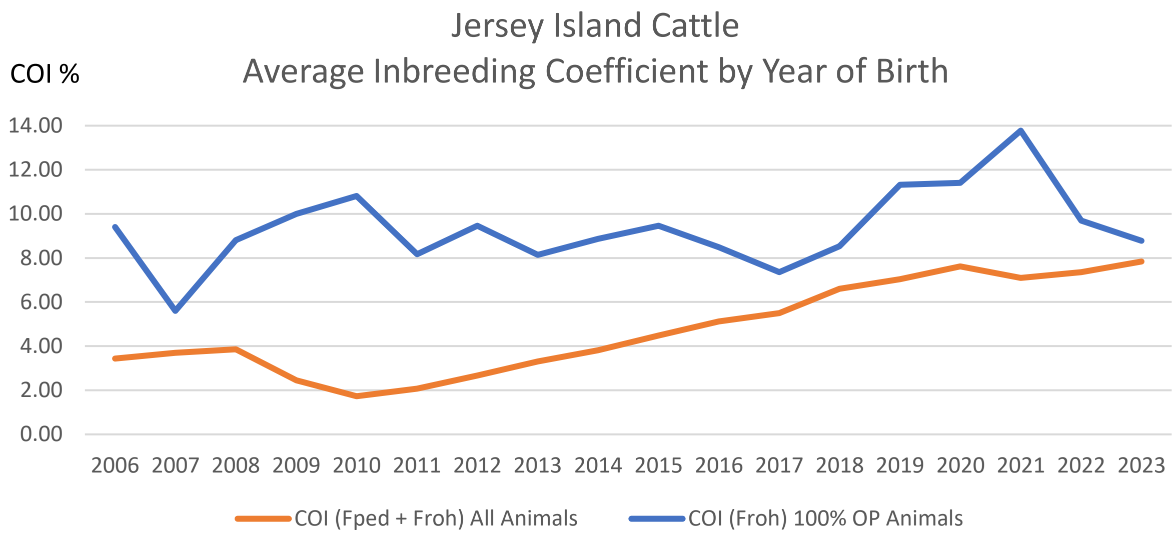
Figure 4.2



These figures are useful in indicating an expected trend of change but caution must be used in terms of the actual numbers due to uncertainties over how much historic pedigree data was imported into the computerised database from which these values were calculated, particularly in the early years. Interestingly the only genomic tested animals in the pre-importation population had an average COI of 8.8% (*Froh*) (Todd - NBDC, 2024).

Further research of the 248 animals which are known to be 100% original Island population (OP), born after 2008, and which also have a genomic profile, have an average COI of 9.22% (*Froh*), see Figure 4.3. The comparative inconsistency in the *Froh* results is due to the smaller sample size of the 100% original population animals, e.g. in 2023, of 852 animals registered, only 7 were 100% OP.

Figure 4.3



The conclusion of this analysis is that the COI of the Island population remains lower than other national populations, even following importation. The importance of monitoring COI is to maintain a balance between genetic gain and genetic diversity. The inclination to make selection decisions only from a few of the very best bulls will increase the risk of raising the level of inbreeding and yet in the long-term genetic gain can only be achieved from a genetically diverse population. Guidelines issued by the FAO recommend that the desired increase in the rate of inbreeding per generation should not exceed 1% (FAO, 2013).

The key, therefore, is to be aware of the COI and develop a strategy for management. It is not considered that levels of inbreeding in the Jersey Island population are a cause for concern, however, consideration should be given to exploring how Island data can be incorporated into a larger genomic data set, to identify diversity for future breeding programmes.

4.5 Amends to Jersey Herd Book rules

When it comes to the image of the Island cows, it has been made clear that a distinguishable Jersey cow holds value to the Island. As the origin place of the breed, Farmers, the RJA&HS and Jersey Dairy believe that Island Jerseys should set the breed standards for the rest of the world, (this includes physical appearance).

It was also noted that when the Island Government changed the law to allow genetic importation there was an unwritten 'covenant' that the industry would monitor and maintain the appearance of the Island cattle population. Anecdotally, there remains some disquiet expressed by the appearance of solid black Angus beef cross animals in the countryside, despite there being no admixture with the Jersey milking herd.

From this review, it was fed back that an additional rule should be implemented, drafted by the RJA&HS, that would remove any cattle from the Jersey Herd Book that exhibited characteristics that are not of the 'true type' Jersey breed. This would include permissible type-colour variations, markings, and perhaps size and weight. This is as a result of unusual markings identified in other populations resulting from non-Jersey ancestry, e.g. a solid white head. It could also occur, and has been observed, as a result of genetic mutation.

4.6 Surplus calves

Surplus calves in the dairy sector are the calves born that are not required as herd replacements. In Europe, many surplus calves are raised for veal (<8 months) at dedicated farms. The Netherlands are one of the top veal producers, with 90% of the veal produced there exported to France, Italy and Germany (Valli, 2014), however the consumption of veal has seen a decline.

In Europe, calves can be transported from 14 days old (often between 14-35 days), this period has been dubbed the "immune gap" where passive immunity from colostrum is decreasing and active immunity has not fully developed, putting the calves at high vulnerability to disease. The risks of transporting calves could be reduced by implementing a 'fit for transport' tool, or transporting calves over 5 weeks old that have acquired a higher degree of immunity (Marcato, 2022).

It has been a well-integrated practice of increasing the value of surplus calves by crossing dairy with beef breeds, in Jersey this has been practiced with Angus and Wagyu with success. RJA&HS calf registration data indicates that the rolling three-year average of beef cross calf registrations has risen by 9% from 2018 to 2022, indicating a growth in the use of surplus calves for the local beef industry.

There is concern, however, that the higher cost of rearing beef in the Island will limit the potential size of the market. In addition, there are insufficient facilities in the Island to rear all surplus calves through to a 24 - 36 month slaughter weight. The option to look for export markets is the only way to further increase the utilisation of surplus calves and efforts should continue in this regard.

4.7 Contingency planning for disease control

It is understood that the Government of Jersey is reviewing current contingency planning and it is essential that robust plans are developed and clearly communicated to all interested parties. Regular simulation exercises should be carried out, both 'walk through' and 'desk top', to test efficacy.

This is particularly important to the Island population where restocking after a catastrophic loss of animals due to a disease outbreak can only be achieved by breeding replacements and not importation of live animals.

4.8 Breeding goals and tailored indexes

A number of stakeholders expressed a view that, now the Island population had benefitted from genetic importation, specific breeding goals should be adopted to provide an opportunity to benchmark further breed progress. For example, this is relevant in relation to work being undertaken to reduce the environmental impact of the industry and the conversion to A2 milk production. An illustration of the power of improved efficiency is demonstrated that since 2008 the Island herd is producing a similar quantity of milk from two thirds of the number of cattle.

There was also some feedback on the desirability of 'tailoring' the breeding indexes used to provide a bespoke ranking of females and males to suit local conditions and goals, including milk payment bonuses.

It is understood that, at the cost of development, an Island specific index could be created by AHDB although there will be ongoing costs associated with monitoring. There may be some benefit to this, in theory, however, in practice it is questionable whether it would change the ranking of available breeding bulls to such an extent that would rule out some sires or lead to the inclusion of others. For example, other than meeting pedigree standards, when criteria such as certified A2A2 and having semen collected to import standard, are applied the list of available bulls becomes more limited and it could be argued that in the interests of avoiding inbreeding, further restriction should be avoided.

Research is being undertaken on the influence of genetics on new criteria, such as methane production, and it may be that in the future, the Island wishes to adopt breeding goals that are different from other populations. In that situation, an adjustment of the weightings of indexes may be beneficial, and as such, research should continue into the practicalities of developing an Island specific index.

Appendices

Appendix 1: Milk recorded production data (all cows qualifying lactation):

Year ended Sep	No. of Lactations	Milk Yield (kg)	Fat%	Protein%	Fat Yield (kg)	Protein Yield (kg)	Somatic Cell Count ('000 cells/ml)	Calving Interval (days)
2008	2650	4506	5.20	3.79	234	171	208	405
2009	2695	4632	5.21	3.81	241	176	206	411
2010	2577	4815	5.19	3.80	250	183	205	412
2011	2606	5003	5.13	3.75	257	188	193	404
2012	2655	5043	5.17	3.71	261	187	192	402
2013	2765	4943	5.25	3.71	259	183	185	405
2014	2715	5190	5.28	3.70	274	192	170	405
2015	2705	5334	5.24	3.72	280	198	177	403
2016	2654	5442	5.33	3.71	290	202	173	399
2017	2500	5543	5.28	3.73	293	207	155	406
2018	2601	5583	5.32	3.75	297	210	171	413
2019	2264	6071	5.41	3.77	328	229	161	405
2020	2048	6489	5.49	3.84	356	249	152	410
2021	2071	6834	5.53	3.87	378	264	158	407
2022	1994	6878	5.53	3.82	380	262	159	396
2023	1877	6988	5.61	3.81	392	266	153	402

Appendix 2: Production index by year of birth, 2023

Year of Birth	Female Averages					Sire Averages					
		PTA				PTA					
	PLI	Milk (kg)	Fat%	Protein %	Type Merit	PLI	Milk (kg)	Fat%	Protein%	Type Merit	Fertility Index
2008	-587.44	-434.48	-0.26	-0.20	-1.57	-617.64	-400.01	-0.32	-0.23	-1.56	1.91
2009	-461.06	-311.08	-0.22	-0.17	-1.60	-346.98	-248.48	-0.13	-0.12	-0.72	0.29
2010	-398.11	-231.31	-0.21	-0.16	-1.24	-210.88	-102.22	-0.09	-0.08	-0.39	0.05
2011	-357.19	-193.96	-0.19	-0.15	-1.14	-173.08	-56.08	-0.10	-0.08	-0.29	-0.10
2012	-350.04	-183.92	-0.19	-0.14	-1.18	-193.26	-70.07	-0.09	-0.06	-0.39	-1.02
2013	-302.39	-150.94	-0.15	-0.12	-0.89	-173.46	-58.24	-0.08	-0.07	-0.22	-0.70
2014	-259.03	-130.90	-0.12	-0.10	-0.64	-123.00	-61.30	-0.03	-0.04	0.08	-0.63
2015	-221.88	-77.41	-0.12	-0.09	-0.51	-90.96	20.08	-0.05	-0.04	0.18	-1.56
2016	-183.48	-41.86	-0.10	-0.08	-0.47	-63.23	43.82	-0.04	-0.04	0.34	-0.75
2017	-131.10	45.06	-0.09	-0.07	-0.39	-0.03	158.34	-0.04	-0.04	0.24	-2.14
2018	-60.25	132.41	-0.08	-0.06	-0.19	79.37	255.17	-0.07	-0.03	0.49	-1.15
2019	-26.02	129.28	-0.05	-0.04	-0.03	121.91	229.41	-0.03	0.00	0.56	-0.19
2020	13.24	200.04	-0.05	-0.04	0.10	158.98	335.11	-0.08	-0.03	0.82	-1.07
2021	44.88	169.25	-0.02	-0.02	0.12	200.30	290.45	-0.01	0.00	0.71	0.85
2022	58.83	163.32	-0.01	0.00	0.08	229.67	300.89	0.00	0.01	0.67	1.63
2023	97.28	199.86	-0.01	0.00	0.31	259.55	325.33	-0.01	0.01	0.76	1.27

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