Sustainable Development of the Island's Dairy Cattle

A Report to the Royal Jersey Agricultural and Horticultural Society

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List of Abbreviations and Definitions

BLUP	Best Linear Unbiased Prediction is a modern statistical procedure which simultaneously corrects production records for known environmental effects and then uses information from all available relatives to predict breeding value or transmitting ability
DAISY	A computer-based dairy information system with provision for including data on health and fertility traits
ETA	Expected transmitting ability (a prediction of an animal's genetic merit based upon the predicted merit of its two parents)
FAO	Food and Agriculture Organisation of the United Nations
INTERBULL	The international organisation based in Uppsala, Sweden, which combines information from many countries and publishes officially accepted evaluations of bulls whose progeny have been milked in more than one country
JBPS	The Jersey Bull Proving Scheme of the RJAHS which organised the progeny testing of 10 young bulls per year from 1988-2003
JMI	Jersey Merit Index – a suggested future total score index combining information on production, type, health and fertility traits
JMMB	Jersey Milk Marketing Board
MDC	Milk Development Council (UK)
MOET	Multiple ovulation and embryo transfer. An improvement programme which relies on the selection of bulls based upon the performance of their full sisters rather than their daughters (as in progeny testing)
PTA	Predicted transmitting ability. The prediction of an animal's genetic merit based upon information from its ancestors, itself, its sibs and progeny which has replaced the older relative breeding value and contemporary comparison. The accuracy or reliability increases with the amount of information and the heritability of the trait. MDC Evaluations Ltd only publishes PTAs on production traits for bulls when the reliability is 50% or above, and for cows 30%, and PTAs/ETAs are not published for young stock although they can in theory be calculated
RBI	Rare Breeds International
RJAHS	Royal Jersey Agricultural and Horticultural Society

1. Background and Terms of Reference

1.1 DEVELOPMENT TO 1983

The current breed of dairy cows in Jersey has been protected for some 200 years against foreign importations. Its role for more than a century, apart from supplying milk and dairy products in the Island, was to export surplus breeding stock to quality conscious dairy industries worldwide. As a result, the total breed today contains substantial populations in New Zealand, Denmark, USA, Canada and the UK, besides smaller numbers in several other countries. Selection programmes in each country have naturally placed different emphasis on each improvement goal. Different 'strains' have evolved, though these may have been partly merged in recent years through trade in semen and embryos. The Island strain alone has remained separate, and it is not surprising that individual herd owners in Jersey have periodically shown an interest in sampling these other strains, either to guard against inbreeding or to improve specific traits. Serious discussion took place prior to 1979 and again in 1983, but successive votes by members of the Royal Jersey Agricultural and Horticultural Society (RJAHS) and the States defeated these proposals to allow importation.

1.2 THE JERSEY BULL PROVING SCHEME

Subsequently a series of reports from specialists made different recommendations on how the new methods of scientific animal breeding might be applied to the Island's cattle. The most acceptable came from Dr Jim Allan of South Africa in 1987, and his reports subsequently dominated the scene. The Jersey Bull Proving Scheme (JBPS) began in 1988 along the lines of his proposals to provide a measurement of genetic variation in components of production and type in the Island cattle. The Breed Improvement Committee proposed changes to make it a continuous progeny testing scheme, and he accepted these in 1991. He revisited in 1993 and put forward suggestions to be considered if the committee was to reopen the importation issue after the first four bull teams had been evaluated through their daughters' performance.

1.3 THE DEROGATION ISSUE

A Future Breed Improvement Policy Sub-Committee reported in 1994 and highlighted a major issue. Put briefly, this was that the case for continuing to prohibit the uncontrolled import of both genetic material and liquid milk rests on the high health status and unique genetic purity of the Island's cattle. Future genetic imports might benefit the breed but put the industry at risk if they undermined the case for continuing to exclude milk imports. Competition from such milk would cause the Island's dairy industry to decline and could so reduce the numbers of cattle that their future as a commercial breed would be threatened.

Since 1994, the Breed Improvement Committee has continued to try to improve the Bull Proving Scheme, and a 1999 report set out a detailed future structure.

1.4 RECENT EVENTS

Recently several much more dramatic events have brought a new urgency to this discussion. A gradual increase in total milk production during the 1990s after many years of stability, coincided with the Island dairy (Jersey Milk) building its exports of mini-pots of milk and cream, and eventually led to a sales licensing scheme (quotas). The loss of some of these markets in 2001 and 2002 led to a restructuring scheme which offered 'exit' packages primarily aimed at entire dairy farms leaving the industry and eliminated over 1000 cows. This contraction of output by over one fifth, exacerbated by a delay in reducing costs at Jersey Milk, threw the entire dairy industry into crisis, and this still exists in spite of some additional States aid.

Responses to this crisis have come from several directions. A 'Strategic Review of the Dairy Industry in Jersey' was commissioned in October 2002 by the States Economic Development Committee and presented by Dr D McQueen in February 2003. The recommendations have been built into the business plan of Jersey Milk presented to the industry by its new Chief Executive (Mr K Keen) in June 2003.

The Jersey Milk Marketing Board commissioned a report from Mr B Woodacre on 'The Profitability of Dairy Farming on the Island of Jersey', and this was completed in January 2003. The JMMB has accepted many of its recommendations under five headings (Jersey Milk, industry structure and governance, producer services, countryside management and farm efficiency).

1.5 THE BRIEF

The Council of RJAHS then decided that its particular concern, the genetic improvement of the Island's cattle, should also be reviewed. The author was appointed in April 2003 to undertake this review with the following brief:

> "To review the current state of the Island herd of Jersey dairy cattle and make recommendations as to the future management and development of the herd on a sustainable basis. These recommendations should have regard for issues of international 'best practice' in breed monitoring and improvement, with reference to developments in any associated infrastructure requirements. Specific recommendations should be made with regard to the genetically closed status of the herd and on initiatives for future breed improvement"

In subsequent discussion with the officers, it was agreed that it might be necessary to provide a series of alternative recommendations in case the preferred ones were eventually found unacceptable or impossible.

1.6 WORKING METHODS

The method of working involved an initial study of many of the written reports from the past 20 years. A visit to the Island (5-11 June) allowed some 20 interviews with herd owners and other interested parties, daily discussions with RJAHS staff (James Godfrey and David Hambrook) and initial and concluding sessions with RJAHS officers. A preliminary analysis was outlined to the President (Derrick Frigot) and David Hambrook on 30 June (at the Royal Show). An interim summary, containing conclusions and recommendations was discussed by Council on 28 July.

Contact was made with several other geneticists and a visit was made to MDC Evaluations at Chippenham for discussion with Gordon Swanson and to obtain data on Island-bred bulls for further analysis.

1.7 THE AUTHOR

The author's background has involved 45 years in various sectors of animal improvement:

- Fifteen years university research, teaching and consultancy in sheep, poultry and pig breeding
- Twenty-one years as Technical Director of an international pig improvement company
- Eight years consultancy mainly in dairy cattle improvement for FAO, the UK Milk Development Council, the Guernsey breed and work with the European Association for Animal Production.

1.8 THE REPORT

The RJAHS expects the specific genetic issues to be addressed. But sustainable animal improvement also involves other issues including health and welfare, economics, organisation and control, and the environment. The Island's dairy cows provide its requirements for liquid milk and contribute some other dairy products and beef or veal. The remaining dairy farmers need a satisfactory financial return on their investments and efforts. The Island's residents and visitors require high quality, safe products at reasonable prices. Furthermore they expect animals to be treated in ways which they can approve, and to be managed in farming systems which help to preserve an attractive rural environment. This report must inevitably touch upon issues beyond the strictly genetic aspects.

It starts with a brief description of the current genetic situation in the Island and overseas. It reviews the available methods of improving a population and considers the goals of such improvement. The report then strongly recommends one particular method and sets out the necessary steps for its implementation. Two alternative options are described in less detail and would need further elaboration if RJAHS decided to adopt either one in preference to the main recommendation.

The Jersey cow has widespread appeal and has become an integral part of the Island's image. In this age of 'branding', it is clear that the presence of these gentle animals is of importance to the whole economy and not merely

to the dairy sector. It is unthinkable that they should be replaced by any other breed. The author has been conscious throughout of the responsibility he carries as a specialist adviser, and hopes that he has been able to understand sufficiently the complex issues which are involved.

1.9 MANAGEMENT OF THE ISLAND'S CATTLE

The author's brief requests "recommendations as to the future management and development of the (Island) herd", and so it seems useful to clarify his understanding of this.

The Island's cattle belong to many individuals who have considerable freedom of action. They can only be managed:

1) by laws enacted by the States (e.g. no imports, or cross compliance in order to get financial aid)

2) within rules agreed collectively by the RJAHS Herdbook

3) by voluntary agreement of individual owners to give up some of their own freedom in the interest of the entire Island breed.

Throughout this report, reference will be made to the likelihood of such voluntary agreement which is fundamental to any Island-wide co-operative improvement programme.

2. Summary and Recommendations

SUMMARY

2.1 A report on the future sustainability of the Island's cattle was commissioned in mid-April 2003 and one week was spent in June in discussions, farm visits and interviews. The report will be one of a series of responses to the current crisis in the Island's dairy industry which aim to help local organizations plot a way forward to a future viability.

2.2 The Island rejected importation in 1983 and RJAHS has been operating a classic improvement scheme since 1988. This was based upon progeny testing a panel of young bulls and promoting the use of the best ones when their proofs come through. Such schemes are effective when efficiently run in large populations.

2.3 The Island population is too small, and RJAHS has failed to get herd owners solidly behind the scheme. As a result, in spite of all the hard work by Society committees and staff, the annual rate of progress in milk yield, the trait which most directly affects efficiency, has been slow (24 kg or 0.6%).

2.4 Meanwhile, there have been much more efficient programmes running for many years in Denmark, New Zealand and USA. These 'strains' have now drawn a long way ahead in production traits (700 to 900 kg milk), though not always in the directions you may wish to follow.

2.5 With the change of policies by the States, the old JBPS can no longer run, and there is currently no semen collection/freezing capability on the Island. New initiatives are therefore essential.

2.6 Before embarking on any new programme, herd owners and RJAHS should engage in discussions on just what should be included in 'improvement' in future. Milk producers are not the only interest group. Jersey Milk must also express a view on what milk composition will best suit its future business; while residents and visitors have an increasing interest in future production systems, animal welfare, and the rural environment, which farmers must not ignore. Selection will be most effective if all these requirements can be brought together with appropriate weights into a total Merit Index.

2.7 A new improvement programme could be introduced based on within-Island selection, but even if it were well run and fully supported, it could not generate a rate of progress in any way competitive with the overseas schemes. The already large lags in production would widen. While the

Island's purity would be of great interest to overseas breeders and scientists, it is unlikely that it would rekindle a significant export income. The interviews conducted with herd owners did not seem to promise sufficient support for an efficient programme to be run, as too many have their own individual agendas.

2.8 The objections to allowing imports of semen from other Jersey strains can be grouped under:

- disease risks
- destruction of a unique situation (a long-recorded, pedigreed, closed breed of dairy cattle)
- danger of introducing non-Jersey genes, and
- the surplus of milk on the Island.

After careful study and discussions with other experts, it is concluded that none of these is so serious as to rule out importation, although several should influence the ways in which such a policy should be implemented.

(Any possible implications for the derogation against free importation of liquid milk were specifically excluded from this study).

2.9 It is therefore recommended that milk producers should be allowed the opportunity to utilise the improvements made in overseas herds. The preferred option is for individual herd owners to be allowed to purchase semen from any bulls which meet their improvement goals but which also satisfy the Island's requirements for health and the RJAHS's decision on breed purity.

2.10 Before the first imports are allowed, several precautionary measures should be implemented.

- An adequate semen bank should be formalised, based upon the existing 'museum' in order to allow current bulls to be reintroduced in the future should this prove useful.

- A DNA bank should be created based on blood samples taken from cows in order to assist in future research.

- A strict health monitoring scheme should be added to the existing milk recording scheme. Producers and veterinarians should be required to provide the data: service dates, fertility, disease treatments, dates and reasons for culling or death, etc. The scheme should give early warning of any problems arising from the use of imported semen, but could also prove valuable in assisting future selection for 'functional traits'.

2.11 The imported semen would add a third type of mating to the existing two (natural service and artificial insemination with local semen). An inseminator service will continue to be needed and this could be run by the States, by the RJAHS, or by the inseminators creating their own service company.

2.12 Procurement of imported semen would be handled by agents based in the Island or UK. The total volume required would be rather small. A back-up

store (sufficient for one year) should be created in case regular imports were interrupted by a disease emergency (e.g. Foot and Mouth Disease in UK).

2.13 The production of frozen semen in the Island will need a new solution as the old facilities are now unavailable, yet the reduced and uncertain demand might make the construction of new facilities uneconomic. As only a few thousand units would be needed, it might be possible to utilise on-farm collection and a simple laboratory.

2.14 A second option would be to allow importation, but to do this only within a co-operative scheme controlled by RJAHS. It would first be necessary to agree on Island-wide improvement goals and a Jersey Merit Index or total score. The Breed Improvement Committee would sort available bulls on published data and through inspections in UK or overseas, import the semen and control its allocation. There does not seem to be any advantage in such a scheme (over free importations), and the problem would be the diverse ambitions of individual herd owners and their unwillingness to submerge their own plans for the common good (as happens in several European breeding schemes).

2.15 A third option, and the only one if importation is rejected by Council, the members, or the States, would be a new within-Island selection scheme. This would be based on the widespread use of young bulls produced from contract matings. Details are provided, but this would suffer from the same disadvantages as the previous JBPS and already summarised in paragraphs 2.3 and 2.7.

2.16 If semen imports are allowed, then consideration should also be given to the use of beef semen from colour marking breeds, but with a prohibition on breeding from any crossbred offspring. Such a practice will only become really efficient when cheap gender control is routine from Jersey semen, and this is not yet in sight.

RECOMMENDATIONS

The clear conclusion is that RJAHS should recognise that it cannot operate an internationally competitive closed breed improvement scheme for the Island's cattle. It would be of benefit to Island farmers and their customers if importation of Jersey breed semen (frozen) were permitted with due attention to the exclusion of disease. It is recommended that application be made to the States to revoke the long-standing prohibition on such imports. Importation should preferably be under the control of individual herd owners, or failing that, of RJAHS.

If importation is not to be allowed, then RJAHS should try to organise a new closed improvement scheme based upon the widespread use of selected young sires.

3. History and Current Situation

3.1 CONFLICTING ADVICE

The detailed history of the Island cattle has been adequately documented by others in previous books and reports and will not be repeated here. This review needs only to summarise attempts to implement scientific animal breeding methods in the Island since 1988.

Faced with the States' decision (in 1983) that improvement should continue to come only from efforts within the Island's own cattle, Dr Jim Allan proposed a major exercise to assess the existing variation in production and type traits. He wanted **all** (3500) cows to be mated to successive annual panels of 15 young bulls for four years. Their 'proofs', based on an average of 50 daughters milked in many different herds, would appear in years 5 to 8, and in those years around 5 proven bulls from each annual panel would again serve **all** cows, thus providing improved crops of heifers and replacement sons. This eight-year cycle could then be repeated.

Previous consultants (Ken Deeble in 1979 and John Broadbent and Chris Bourchier in 1985) had all concluded that the Island was unable to run an efficient improvement programme based upon progeny testing to identify proven sires. Nevertheless, Dr Allan believed that the Island could build the necessary infrastructure to make such a programme effective, based upon a much greater use of AI, an improved understanding by herd owners and the better evaluations being developed by the data processing centres.

The RJAHS clearly thought that his proposal was impractical and, while continuing to use his counsel, they instead adopted what evolved into a conventional, continuous progeny testing programme involving fewer than one half of the Island's cattle. The Breed Improvement Committee did its best to get the scheme accepted by herd owners and, over the 15 years of its operation, has studied the problems and results and tried to improve its efficiency. Successive chairmen and members have produced reports with modifications, and RJAHS staff have greatly assisted in these modernization attempts. Now, however, in 2003 the consequences of several unforeseen events have brought it to an end.

3.2 UNFORESEEN EVENTS

- In April 2001, Foot and Mouth Disease once again struck the British mainland and the Island had to implement severe restrictions on movements between farms and the AI centre. These lasted until the end of the year and naturally reduced the numbers of inseminations achieved within 12 months from the latest young bull panel.

- The financial crisis among all producers caused by the imbalance between milk supply and demand has led to the questioning of all expenditure (e.g. AI fees), and a heightened interest in more efficient cows.

- Reorganisation within the States eliminated the previous Department of Agriculture and placed responsibility for the industry within a new Department of Economic Development. Like all governments, the States of Jersey is reviewing the levels and methods of support which it provides, and seems likely to place the responsibility for the provision of services (AI service, milk recording etc) firmly with producers and their organizations.

- The States' lease on the Island's AI centre and bull rearing unit will shortly expire. It will not be renewed, and the facilities will be eliminated.

It is therefore clear that the old Jersey Bull Proving Scheme is now finished and new arrangements need to be put in place.

3.3 LESSONS FROM 15 YEARS OF PROGENY TESTING

When considering how to 'manage and develop' the Island herd in future, it is important to ask "What can be learned from these past 15 years of experience in the JBPS?"

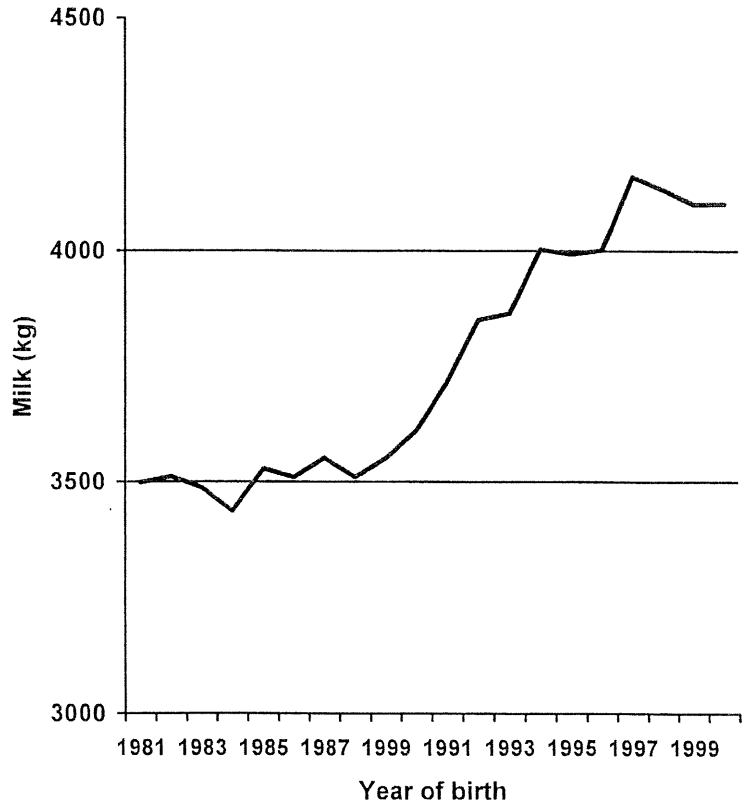
The author can only use hindsight since he was not involved during the past 20 years when successive decisions were made. With this huge advantage, many things now look quite clear!

A great deal of gentle encouragement and instruction was given by Dr Allen to try to help a group of independent herd owners embrace the principles of scientific animal improvement. But the new situation allows, and indeed demands, some plain speaking, and this report is bound to be more critical than any of those previously presented to RJAHS.

A breed improvement scheme relying on the progeny testing of annual panels of young bulls has been implemented, based upon the dedicated work of the Breed Improvement Committee and the AI team and the co-operation of the participating herds (encouraged by generous incentive payments from the States). Alan Treanor has given a valuable and enthusiastic summary of the first 10 years of the scheme in his 1997 paper to the Albert Messervy Memorial Conference.

Modest gains in production traits have indeed been made. The first lactation averages of cows are shown by year of birth in Figure 3.1. These are the actual means (from the July 2003 analyses of MDC Evaluations) and therefore reflect the combined effects of nutrition, management, disease and genetics (the phenotypic trend). During the earlier years, there was no obvious change, but from the 1987 or 1988-born heifers, there was a reasonably steady increase in milk yield of about 46 litres, or 1.2% per year. How much of this was due to genetic change?

Figure 3.1 Jersey Island Cows. First lactation average milk yields (kg) by year of birth. Actual yields (phenotypic)



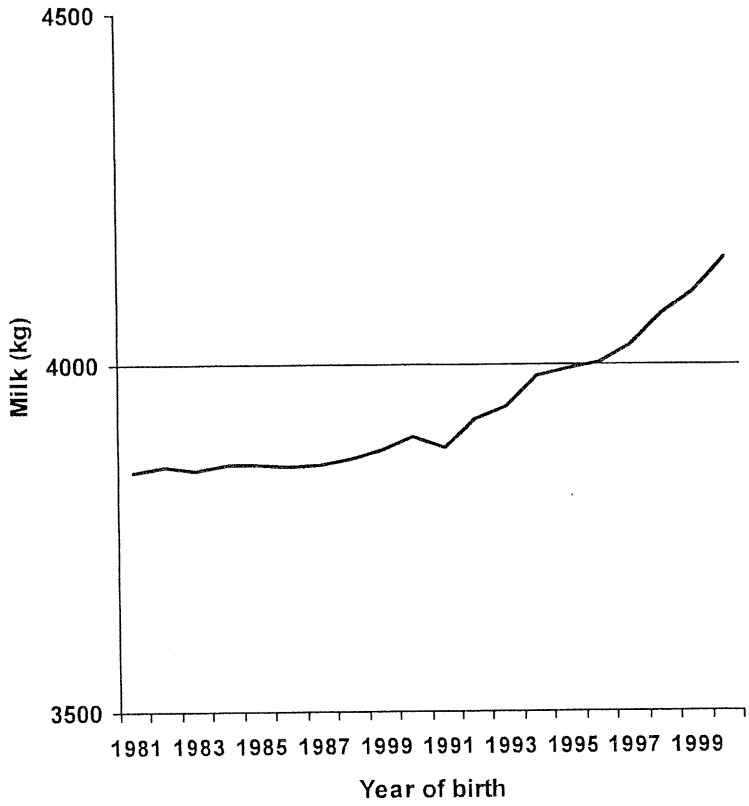
(Data supplied by MDC Evaluations Ltd)

Figure 3.2 shows a similar picture, but this is based on the estimated **genetic** means of the annual groups (again, from MDC Evaluations) after attempting to eliminate environmental changes (e.g. more intensive feeding). The trends are remarkable clear: virtually a genetic standstill through the 1980s until the daughters of the first JBPS team appear (1989 born). From then on a steady increase in milk yield over the following 11 years at around 24 litres or 0.6% per year[1]. This suggests that breed improvement efforts have been responsible for about half of the total increase in milk yields during this period.

Total yields of fat and protein (not shown) almost kept pace with milk yield, indicating that there was only a slight genetic decline in milk composition (-0.06 in fat percentage and -0.03 in protein percentage over 11 years.

[1] The author believes that genetic trends should be expressed as breeding values in this way, realising that individuals only pass on one half of their breeding value to their offspring. It is quite common in dairy cow publications to express trends in terms of PTAs which thus appear to show only half the underlying rate of improvement. It is not always clear which system was implied in past reports to RJAHS.

Figure 3.2 Jersey Island Cows. Estimated genetic average milk yields (kg) in first lactations by year of birth



(Data supplied by MDC Evaluations Ltd)

Nevertheless, it has to be clearly stated at this point that the early consultants were correct. The Island has not been, and never will be capable of running a competitive programme of this type. For comparison, the Danish national programme has available some 69,000 recorded cows (not large by world standards). It uses one third of the 90,000 inseminations to test 75 young sires annually from which 5 to 7 are eventually selected as proven bulls to use on the other two-thirds of the females. Their current target is to achieve an annual increase in both fat and protein yields of 1.5 to 2%.

In the UK, the national selection programmes have never been as efficient, and in recent years progress had been based upon a combination of importation and progeny testing. Jersey cows have shown an annual genetic trend in milk yield of just under 80 kg or 1.8% between 1990 and 1999 (MDC Evaluations Report, May 2003) but it would not be easy to separate the contributions from selecting within the UK population from those due to imports.

The problem in the Island has been partly one of population size. There have only been 800-900 recorded first lactations each year. Since the

milking population was recently reduced by 1000 cows, this number is bound to fall further. Many more would be needed to provide accurate bull proofs in sufficient number to allow several really superior sires to be identified each year with confidence. To use just one or two to sire sons and more daughters would only create future inbreeding. The Island's herd owners have begun to realize this themselves. Many are concerned at the paucity of good proven sires; others are worried by what they believe has been excessive use of one proven sire (Felix) and his sons.

But size is not the only problem. The Island's cows were grouped in some 103 herds at the beginning of the JBPS. Even today there are around 37. Many herd owners have not been convinced that the future of their cattle is best served by full commitment to the scheme in spite of very generous States subsidies. On average around 48% of all registered heifers have been sired by natural service bulls between October 1992 and September 2002, most of which would not have been JBPS bulls, current or past. No fewer than 128 bulls sired the heifers registered in 2002/3.

When asked if they would be willing to participate more fully in a future co-operative breeding scheme, most of the 16 herd owners and managers interviewed in June 2003 had serious reservations. Yet cattle breeders in some other countries have realized that it is in their own interest to co-operate and thus ensure that the whole breed moves forward more quickly. Only one week after these interviews the author was in Northern Germany and found that Holstein breeders had long accepted that **all** heifers had to be mated to test bulls or else they paid a fine to the breeding organization!

If a small population is to be improved from within its own resources by using modern breeding methods, it must be a co-operative effort with strict disciplines. There are too many Jersey milk producers who still believe they can be independent breeders by their own efforts, and who despise the concept of a co-operative programme. But while they may enjoy the luxury of their apparent independence, the reality is that the Holstein in the Netherlands and Jerseys in Denmark, both products of such programmes, have contributed greatly to the efficiency of their internationally competitive dairy industries. Similarly, the uniformly good breeding stock kept by modern pig and poultry producers worldwide has greatly lifted the efficiency of those industries and lowered the real price of food to consumers.

It was clearly time to stop the JBPS, even if external events had not done this independently. Any future programme to 'manage and develop' the Island's cattle must be based on a realistic assessment of the limitations imposed by the small total number, their subdivision into separately owned herds and the likely degree of co-operation between their owners.

4. Evidence for Strain Differences

4.1 POSSIBLE ORIGINS OF STRAIN DIFFERENCES

As long as the Jersey breed of cattle was restricted to its island home it was possible to talk of a single population with a certain mean performance level in any one productive trait, although of course showing variation both between and within herds. As the export trade grew up during the 19th century, so sub-populations became established in several countries. Exports have continued until this day, but the time is long since past when one could consider these sub-populations as identical to the Island cattle. They would have diverged genetically for several reasons:

- the exported stock might not have been random samples from the Island herd. For specific traits they might have been better, or worse, or merely different (e.g. coat colour)

- random changes of gene frequency occurred (even loss of specific alleles) in the overseas populations while they were still numerically small

- successful selection for different traits has surely taken place in overseas populations

- immigration of genes from other breeds. This will have been accidental (where crossing with other breeds occurred but was unrecognized), or deliberate; either declared (in official grading-up or recovery programmes), or concealed. Not every cattle breeder will have been completely meticulous or scrupulous!

In recent years, many countries have recognized the superior milk production of United States cattle (not merely in the Jersey breed) and have imported US semen and embryos. The various world-wide strains (outside the Island) may therefore have been drawn somewhat closer together by this process.

Some statistics on these strains are given in Table 4.1. These show that the two largest groups by far are in New Zealand and USA. Their actual yields and milk composition vary enormously though the tabulated results cannot be simply compared.

4.2 ASSESSMENT OF STRAIN DIFFERENCES

What then is the evidence that today's national strains of Jerseys differ in important traits? This can be answered in two ways:

First, by breeders visiting those countries or looking at sufficient stock derived from them in UK herds. Members of the 1994 Breed Improvement Committee visited Denmark (1991) and England (1993) while RJAHS officers and staff, besides other members, have made more recent trips and have other contacts.

Table 4.1
Some statistics on overseas strains of Jerseys. Actual (phenotypic) yields

Strain	Number of cows/cattle	Milk yield (kg)	Fat kg	Fat %	Protein kg	Protein %
Denmark	69,000 milk recorded cows	5,830 in 2001	349	5.98	237	4.10
		Objective 6,800 in 2010	395	5.80	279	4.10
USA	378,000 registered cattle 525,000 recognizably Jerseys 72,507 registrations 2002	8,182[1]	373	4.56	291	3.55
		Objective 9,330 in 2010	422	4.52	336	3.60
Canada	9,036 in 2002	Actual 305 6,407	310	4.86	245	3.84
		Objective 8,000 in 2010	400	5.00	320	4.00
New Zealand	413,310 recorded in 2001/2	2,889 in 225 days	164	5.67	117	4.05
UK	13,314 recorded in 2001/2 Probably 30,000 total cows	5,078 actual	271	5.33	196	3.87

[1] Mature equivalent 305 days

[Sources: Peter Larson, Danish Jerseys, WJCIC 2002; Cherie Bayer, American Jersey Cattle Association website and email; Russell Gammon, Jersey Canada, WJCIC 2002 and email; John Allan, Jersey, New Zealand, email; NMR Report and David Hambrook for UK]

Warning: These data do not allow simple comparisons between strains as they are based on heifers, all cows or mature equivalents, while New Zealand lactations are shorter. They also include the combined effects of genetics, nutrition, and management system. For an attempt to make genetic comparisons from adjusted data, see Table 4.2.

Second, comparable production data may be obtained adjusted for the environmental differences between countries.

The UK Animal Data Centre in Chippenham (now MDC Evaluations Ltd) analyses both the UK and Island data (but separately), and also publishes the Interbull production conversion formulae for bulls in third countries where these have not had a UK progeny test. These conversions are only possible where there has been sufficient movement of genetic material between countries to provide adequate accuracy. The policy on accuracy levels adopted by MDC Evaluations means that there are no published formulae for converting bull proofs from other countries to an Island basis. The May 2003 report does, however, show the formulae for use by UK herds and from these it is possible to compare the genetic means for production traits in the four main overseas 'strains'.

For the purposes of this report it is obviously unsatisfactory not to be able to make such comparisons with the Island cattle since this is one of the primary questions being asked. While no overseas bred bulls have been permitted to have Island progeny, there has been a flow of bulls and semen to the UK so that there are many of their daughters recorded alongside UK contemporaries. Gordon Swanson, Technical Director of the Evaluations Unit, kindly agreed to make the PTAs available on a confidential basis for all bulls used and these predictions were extracted for those sires with reasonable numbers of daughters in both data sets (reliability above 75%). By calculating conversion formulae from the UK to the Island, it was thus possible to make all the comparisons with Island cattle (Table 4.2), although their accuracy is less then one would like.

Table 4.2
Heifer-equivalent production levels of Island Jersey cows born in 1995 and the estimated genetic superiority of average Jersey heifers born in the main overseas strains

Strain	Milk (kg)	Fat %	Protein %	Fat (kg)	Protein (kg)
Jersey Island	3993	5.31	3.66	212	146
UK	+302	+0.22	+0.10	+26	+16
Denmark	+920	+0.30	+0.18	+62	+42
USA	+918	-0.16	+0.04	+42	+36
New Zealand	+718	+0.04	-0.06	+40	+24

(based upon conversion formulae derived from data supplied by MDC Evaluations Ltd as well as Interbull conversion formulae.)

The first row of figures is the average performance recorded on the Island from 815 heifers born in 1995. Subsequent rows show by how much the groups of heifers from the other countries but born in the same year would have exceeded this performance had they been reared and milked in the Island environment. Thus Danish-bred heifers would have yielded a lot more milk and with higher fat and protein levels.

Naturally the two tables do not tell exactly the same story. It is not clear whether the genetic differences have been adequately separated out in Table 4.2, but they are the best estimates we have.

4.3 EXPLANATIONS OF STRAIN DIFFERENCES

These figures are a reminder of the power of selection to move a strain in the direction required for the commercial market by harnessing the naturally occurring variation.

The Danish national improvement programme supplies semen to dairy farmers who are paid for fat and protein production which is the basis of their butter and cheese exporting factories. Their genetic levels for fat and protein yields are now around 29% higher than in the Island, and their milk yields are some 23% higher.

In contrast, Jersey breeders in the USA have selected more for milk yield and have not been rewarded for butterfat so they have allowed their percentage fat to slip in pursuit of volume. In their projections to 2010 they are clearly aiming to stay competitive with Holsteins by selecting hard for

increased milk, up to 9330 kg (mature equivalent), while allowing percentage fat to decline further. (Canada has some good cattle but with only around 9000 recorded lactations in 2002 they are wholly dependent upon USA.)

Conditions in New Zealand are quite different again, with low-cost seasonal pasture-based production directed towards milk solids. The national programme currently selects for profit and efficiency of production which means a premium on small cows giving high solids milk and a negative weight on 'carrier' (the water content) to cut down on transport costs from farm to dairy. The average lactation length is only 225 days as cows are dried off when the grass declines and the dairy factories close.

As expected, performance of the UK 'strain' is not so far removed from the Island cattle, partly because there has been more genetic movement from one to the other, and partly because there has been less selection. This presumably reflects the rather small number of cattle in UK (only four times as many recorded cows), the fact that many used to be in the hands of owners who were mainly concerned with good-looking cattle producing quality milk, but also that no UK-based genetic improvement programmes have been very efficient. The UK population has been unable to organise an effective within-strain scheme and mainland breeders have begun to rely heavily on imported semen. So while Island herd owners may take some comfort that their cattle are not lagging too far behind the UK, they should not! It is the UK herd owners who should be more concerned that they are slipping more and more behind the Holstein while they are not making best use of the breed's worldwide resources.

4.4 OTHER TRAITS

These production traits are not the only ones of importance to the Island's dairy industry. Somatic cell count (SCC) is a further aspect of milk quality which is related to mastitis incidence. Ease of milking, disease resistance, fertility, and the resultant herd-life or longevity also have real commercial value, and breeders have historically tried to predict several of these from assessments of type and conformation in young animals. Unfortunately such judgements have often been complicated by show ring fashions or personal preferences which have had little to do with the true efficiency of milk production. In recent years there has been a strong movement towards type classification based upon linear assessment of a limited number of traits. This aims to describe what an animal looks like in a way which is repeatable between assessors, so that bulls may be compared based on data from their female relatives. Scientific research continues to seek methods of using these type data to help predict health and longevity more accurately. Without doubt the overseas strains differ in type from the Island cattle, but the 1994 Breed Improvement Committee was able to report that while the other strains were showing higher production, this could be combined with good looking cattle and udders, although Danish cows were described as 'plain but functional'. A number of Island producers surveyed for this report expressed a wish to have taller cattle to facilitate modern milking methods through several lactations.

5. Improvement Systems

Before making recommendations on the future management and development of the Island's dairy cattle, it is necessary to review just what improvement systems are available. In this report, the word 'population' will be used to refer to a more or less closed group of cattle. The worldwide breed of Jersey cattle is divided into several populations or strains (discussed in Section 4) and there is genetic variation both between them and also within each one. It is usually much easier to recognize and utilize the between population variation.

5.1 SELECTION BETWEEN POPULATIONS LEADING TO BREED OR STRAIN SUBSTITUTION

Were there is more than one population to choose amongst, then it may be possible to assess each of them accurately (eliminating environmental and management differences by carefully designed trials or by statistical analysis), to evaluate their performance against the agreed improvement goals (see Section 6), and then choose to utilise one rather than the others. This is reasonably simple for a farmer when deciding which cereal variety to grow based upon previous crop trials. He abandons his old choice as soon as he is convinced that an improved variety is available. It is also possible for a UK milk producer when deciding whether to remain with Jersey cows or replace them with Holsteins. In theory he can sell all his existing herd and buy in a replacement herd from a single or multiple sources – though no doubt most people would do this more gradually, perhaps over several years.

For the entire Island 'herd' of Jersey cattle, this is obviously not a possibility in such a simple, immediate fashion. But it would be possible to identify one of the national strains of Jerseys as the preferred sort and to replace the Island strain by using 100% imported semen for several generations and 'grading up' to the chosen source. (In this report, the idea of replacing the Island cattle with another breed, for example Holstein, is rejected as being too radical a change, having widespread repercussions on the Island's image and 'brand'.)

5.2 BREED (OR STRAIN) CROSSING

Crossbreeding systems are widespread throughout modern animal breeding. Virtually all commercial poultry and pigs are crossbred today, as are many sheep and beef cattle. Crossbreeding may seek to utilize the good points of two or more populations or to benefit from the possible advantages in fitness of crossbreds over their purebred parents, and so, as in the first system, it exploits variation found **between** populations.

It seems unlikely that any of the overseas Jersey strains has become sufficiently genetically separate from the Island cattle to produce 'hybrid

vigour' in terms of improved fertility or longevity when crossed onto Island herds. (The well documented vigour in **breed** crosses e.g. Jersey x Holstein, comes from the greater genetic 'distance' between the parent breeds.). The more obvious reason for wanting to produce strain crosses (imported semen onto Island cows) would be to introduce favourable genes which are not present in the Island today, or which have much higher frequencies in one of the other strains. This could, for example, apply to genes influencing butterfat levels in Danish Jerseys. They could be utilized in the same way as breeders currently 'outcross' to unrelated animals within the Island, and then select among the progeny to try to achieve the optimum combination of new and existing genes or traits. In this way, one might combine Danish fat levels with udder conformation from the Island cattle.

Both of these improvement systems can be very reliable in that they depend upon exploiting real genetic differences revealed by the initial between-strain comparisons. So the accuracy of predicting the selection result is close to 100%. In this sense they must always be the preferred improvement methods.

5.3 WITHIN BREED (OR STRAIN) SELECTION

Selecting for superior genotypes **within** a closed population (or breed or strain) is much more difficult and, because decisions between individuals are less reliable or involve long delays (e.g. progeny tests) it will usually produce slower progress. The accuracy of identifying an animal's breeding value from its own first performance can be expressed as a function of the heritability of the trait. Typical values for heritability would be only 10% for fertility, 25-35% for milk yield, but nearer 50% for fat percentage. Only in the case of a bull having many recorded daughters in several herds does their average performance come close to being 100% accurate as a prediction of his future performance.

5.4 PROCEDURE AFTER USING BETWEEN STRAIN VARIATION

Usually after first capitalizing on between-population differences through crossbreeding or strain crossing, one must return to the slower within-population selection system as the only sustainable method of continuous genetic improvement. But in the situation under consideration here, the Island Jersey population, it would be possible to avoid such organisational problems and costs indefinitely, just so long as effective selection is being achieved for the Island's improvement goals, in one or more overseas strains from which semen can be imported. The Island's herd owners could just 'piggy back' on the hard work being carried out in these other strains. Continued use of imported semen would not produce the same gains as in the first two or three generations but should continue to deliver useful annual gains – for only the price of the semen.

6. Improvement Goals

6.1 HISTORICAL

It has been a fundamental characteristic of farmers, and especially those grouped together in a breed society, to strive to 'improve' their livestock. Such improvement has often involved changing the appearance of the animals (type) in the eyes of the owners and fellow breeders. In the case of the Island, this was also to suit the overseas buyers who for long periods provided as much, or more, income than from local milk sales. Nevertheless, much of the selection in the past 50 years in all breeds has been to try to increase yields as a means of increasing the efficiency of production. While this is usually viewed as a means of increasing the producers' profitability, the real beneficiaries are consumers. The benefits come in the form of reduced food prices because inflation-adjusted farm-gate prices have been continuously forced down.

At this time, when the future improvement of the Island's dairy cattle is to be decided, it is surely vital to reassess these improvement goals and try to incorporate the interests of all the 'stakeholders'.

6.2 MILK PRODUCERS' GOALS

Milk producers are mainly thinking of improved production efficiency which means cattle which make better use of all the farm's resources (feed, labour and capital). They mostly translate these into higher yields, improved fertility, health, longevity and milking convenience. Because some of these are complex, difficult to measure, or only revealed slowly as the cows mature, herd owners substitute many different type components which they believe have predictive value when assessed in the young animal (feet and legs, mammary system, angularity, dairy character etc). They thus try to achieve their efficiency goals by assessing both production and type traits.

6.3 JERSEY MILK'S REQUIREMENTS

The dairy, charged with accepting all their output and maximising its sale value as a range of products, should surely have an interest in the Island 'herd's improvement goals. It currently pays a flat rate for all liquid milk within a producer's licensed volume (apart from a premium for organic milk and deductions for high somatic cell count). The new management is committed to reviewing its needs for fat and protein and deciding whether to relate future payments to milk component levels. It is by no means obvious that traditional concepts of quality (high fat milk) should be encouraged by bonus payments. In an island where **all** milk comes from a high-fat breed, but where consumers have mainly changed to drinking 'half-fat' or 2.5% milk, the commercial answer presumably depends upon the volume and value of cream and other by-product sales. But Jersey Milk

must accept that milk producers, particularly under financial pressure, will tend to produce what pays them best. If their milk price is unrelated to components, then these (percentage fat and protein) would be expected to decline (as in USA) if only because of the negative genetic correlations with milk yield. It would seem essential for the dairy to at least have declared target levels whether these are the same, higher, or lower than today's average. Decisions about whether to back these up with payments to help achieve them can be made later. The fact that percentage fat in Island milk has not declined much in recent years should not breed complacency: a heavy use of US semen could cause a considerable drop.

6.4 CONSUMERS AND CITIZENS

The third group of stakeholders contains the Island population plus its visitors, acting both as consumers and citizens. In their dual roles as buyers of milk products and providers of government subsidies, they are likely to take an increasing interest both in the way their food is produced and the effects that dairy farming has on the Island environment. It seems likely that they will want to see grazing cattle, and be assured that they are healthy and live long unstressed lives. They may go further and impose maximum stocking levels to limit excretions. It is at least possible that a relatively affluent population might be more interested in these aspects than in slight reductions in the retail price of milk, though it is unlikely they will speak with one voice.

To date, farmers have been accustomed to setting their own improvement goals but this must now change. They have to realize that they have an implicit covenant with the community that they will respect the wishes of the urban population in return for which the community will support dairy farming rather than allow 'black and white' milk to come in at mainland prices. It may be healthy if this covenant becomes more explicit.

6.5 COMBINING GOALS INTO AN OVERALL INDEX

During the last half-century, scientists have evolved quantitative methods to bring together such multiple objectives (selection index theory). While the calculations are not simple, and the necessary data to make them optimal are not always readily available, they do allow all the competing objectives to be given the appropriate emphasis during the selection process according to their initially agreed relative importance. Selection decisions based upon such an overall or Total Merit Index should be much more efficient than when the breeder is faced with a series of separate evaluations on milk yield, components and aspects of type (even if these are in the form of PTAs). But breeders will only use such a Merit Index when they are convinced that the scientist/technician has understood their needs and **why** it is constructed.

6.6 FUTURE EXPORT SALES

Most of the herd owners who were interviewed agreed that their primary task is milk production for the Island market. At the same time, several expressed the wish to once again earn additional income from the sale of surplus cattle, semen or embryos to other producers, particularly overseas. This is an understandable aim and there will always be a certain trade to establish new herds or expand others. But in any Island-wide improvement programme, the issue is 'How much emphasis should be given to such

aspirations?'. This is a particularly emotional issue in the Island because of previous breeders' historical role in populating Britain and her colonies, the USA, and other countries. But is it any longer realistic to think that the Island can ever regain sufficient export business to justify changing the weightings which will be appropriate for the purely domestic market? For example, there is a real possibility that Jersey Milk's specification for its desired milk composition might be different from that in overseas markets where the breed fills a role as a producer of premium milk or butter. Or again, some herd owners have suggested that they should deliberately try to aim away from today's mainstream objectives in overseas markets in order to create a clear difference which might prove attractive.

The author's firm belief is that cattle breeding worldwide will become increasingly science-based and focus on both producers' and consumers' demands. Improvement will be created almost exclusively by large-scale genetic programmes run by technically trained staff, even if herd owners provide the overall policy role. The only uncertainty is the speed with which the individual breeder is superceded. The process has already gone much further than the breeder and milk producer realise. The technicians do not stress the point because the customer for their improved genetics (the herd owner) does not always like the idea of his increasing impotence and individual irrelevance.

It follows that there is no significant long-term future for export sales from an Island population which is unable to run a world-class independent improvement programme. The objectives and methods of any future co-operative programme on the Island must therefore be focused on goals relevant to Island producers, consumers and citizens, as outlined in 6.5 above.

7. The Case Against Importations

7.1 BACKGROUND

There is an urgent need to restore the profitability of milk producers, and this is being tackled on a number of fronts. This report is only concerned with how the Island's cattle can be adapted to the changing conditions. It is obvious that no genetic change can produce short-term responses, but that is no argument for delaying decisions. The recent radical changes in the facilities and support that have underpinned the JBPS during the past 15 years make it necessary to adopt new plans.

The evidence reviewed in Sections 3 and 4 shows that progress towards increased productivity has been very slow within the Island's closed population, while several of the overseas strains have made substantial gains in slightly different directions. The creation of genetic change by identifying potentially superior individuals within a population is slow and often costly. It is therefore a general rule that one should always first utilize any improvement already accumulated in other related populations **unless there are strong reasons against it**. Before this action can be recommended for the Island, it is thus necessary to consider any such reasons.

7.2 DISEASE RISKS

The history of livestock improvement has far too many examples of serious diseases having been introduced, or increased, through transfer of breeding animals, and even fresh semen. On the other hand there is a great deal known about the transmission of many pathogens, and genetic material is constantly being shipped around the world without causing harm to the recipient. The Island's cattle are generally healthy and free from several serious problems, which are common in other countries – but they are not disease free! In the survey work already done, both the States Veterinary Officer and the RJAHS consultant veterinarian have expressed the view that frozen semen and embryos could be allowed into the Island under appropriate control protocols with minimal risk of introducing new infections. The ability to freeze both semen and embryos is a valuable safeguard since the donors can be kept under surveillance for some time after collection in case they turn out to have been incubating infections.

No doubt the veterinarians would want to draw up regulations covering the testing required to keep out pathogens that are currently absent from the Island, (additional to those already imposed by the EU). But it would also be advisable to have in place a strict monitoring scheme aimed at the earliest possible detection of problems, and their containment and possible

elimination. Such problems would include all microbial infections but also genetic defects and aspects of fertility and metabolic disorders.

7.3 DESTRUCTION OF A UNIQUE SITUATION

The Jersey Island 'herd' is unique among populations of dairy cattle by virtue of the long period during which it has been closed to outside blood but with full pedigree recording. Any significant genetic introductions will destroy this situation. The question is therefore whether this uniqueness has a sufficiently high value to negate the benefits which would flow from the rapid raising of milk yields and production efficiency, or improvement of other chosen traits.

During this long period, the breed will have become adapted to the local conditions of soil, climate and farming system, although nutrition, housing, herd size and management have changed greatly in recent years. In addition, there may be alleles (forms of genes) preserved on the Island which could be valuable in new scenarios which cannot yet be predicted. The beneficiaries of these could be future producers and consumers rather than those of today. It is impossible to put a value on such genes. But neither is it certain that they would be lost any faster through importation of semen from overseas strains than by intense selection for improved performance within the Island. In any case, with so many animals exported during the past 200 years, there must be a good chance that all the original variation will still exist in one or more of the overseas strains. But as a precaution, it would certainly be useful to preserve a genetic record of the current population. This could take two forms. A museum bank of semen already exists and could be augmented from all current living bulls. This could permit old genotypes to be reproduced in future years. Secondly, DNA samples could be separately taken and stored, perhaps from the current cows, and this could be a valuable resource for future researchers.

The Island population is listed by Rare Breeds International (RBI) on its 'endangered' register. While this currently has no financial implications, it is just possible that RBI or FAO might one day agree to provide some degree of support. It would at least be worth enquiring whether these organisations might provide help towards the DNA bank since this would be a single exercise rather than an ongoing subsidy to maintain a living population.

Some discriminating consumers will increasingly seek out and pay premium prices for food products which conform to their ideas of continuity and integrity, and indeed this influences some of the author's own food purchasing. But it would surely be difficult to sustain the argument that an Island herd, refreshed by importations of Jersey genetics, had so departed from such standards as to lose all appeal to these premium markets on the Island or further afield.

The author admits that his primary interest is the management of breeds for foreseeable production requirements. He is not persuaded that the real value of this unique population is so fragile that it is essential to preserve the status quo in the face of the arguments favouring change.

7.4 DANGER OF INTRODUCING NON-JERSEY GENES

Those in favour of allowing importation to the Island have been quoted as saying that it would only involve 'calling back' genetic material from countries which had been 'looking after' it following the initial 'loans'. The 1994 report from the Breed Improvement Committee took some pains to explore this subject. Its authors concluded that in Canada, Denmark, New Zealand and USA it would be quite possible to identify cattle whose pedigrees traced in all lines back to the Jersey Island Herdbook. While this gives a high degree of reassurance, it cannot be 100%. From blood group or DNA analyses it is known that not all pedigrees are correct! Some overseas Jersey cattle will definitely be carrying small percentages of non-Jersey genes since there is likely to have been 'grading up' from other cattle either approved by the Herdbook, or undeclared.

However, it is possible to adopt too purist an attitude. All breeds started off from crossbred foundations, and introduced genes are most likely to have persisted through subsequent generations of pure-mating if they conferred advantages on the animals which possessed them. Nevertheless, if it is deemed desirable, in order to be able to say that all precautions against non-Island genes have been taken, then importation could be limited to those animals which had no declared other breeds in their ancestry, or that had no non-pedigree ancestors (from 'recovery' programmes). It is not clear how restrictive such a condition would prove, and it should be investigated before Council took any decision on the matter.

7.5 WHO WANTS HIGHER YIELDING COWS WHEN THERE IS ALREADY A MILK SURPLUS?

This is not really a valid reason to prevent imports. It can be countered in two ways. First, most milk producers would probably opt to keep fewer, but somewhat higher yielding, cattle and still fulfill their quota. Second, there are many other traits which could be improved if increased milk yield per cow is not needed. High fat and protein levels, less susceptibility to mastitis and other metabolic diseases, better feet, legs and udders for greater longevity under grazing conditions could all be targeted. The Scandinavian countries have been much more alert to the need to include so-called 'functional' and health traits in their selection programmes, and it seems likely that Danish Jerseys might already have advantages in these traits which could be utilized in Island herds. Discussion on improvement goals should certainly be asking if progress in these traits would not be more appreciated by the consumer than small reductions in product prices through greater efficiency. If imports of liquid milk continue to be excluded, then the Island might be one of the few places in the world where selection pressure could be allocated mainly to non-production goals!

7.6 THE CASE IS REJECTED!

From this short review, the author concludes that none of the suggested reasons against importation is sufficient to rule out this simple way of improving the Island's cattle. Having said that, several of these issues are sufficiently important to affect the ways in which the option to import semen should be implemented. The following section provides more detail of how such a major change of policy could be implemented.

8. Recommendations for Developing the Island's Cattle. 1: The Preferred Option

The course recommended to the RJAHS is to encourage its members to utilise the improvements made in overseas strains of Jersey cattle through importation. This would presumably require a change in the regulations governing the Society's Herdbook, and more importantly, an agreement by the States of Jersey to amend the law. It is recognized that such an amendment might have implications with regard to derogations from EU legislation on free trade in liquid milk, but that issue was specifically excluded from the author's brief.

8.1 TYPES OF IMPORT

There does not seem to be an adequate case to allow the importation of live cattle of either sex, nor of fresh semen, because of the increased risk of introducing disease. Frozen semen is a reliable convenient and cheap method of genetic transfer. A huge advantage for the Island is that frozen semen is available from proven sires with sufficient daughter records to give a high reliability to the calculated PTAs. Using the top bulls listed in the current MDC Evaluations rankings, it is reasonable to expect that their Island-bred daughters could immediately have increased milk yields of 400 litres or fat content of 0.3%, or improvements in other traits according to the herd owners' specific goals. Their grand-daughters could gain a further 200 litres. The gain in a single generation compares with the increase in the Island previously shown to be around 270 litres in the 11 years between 1989 and 2000.

Frozen embryos could also be imported, but the value of doing so seems doubtful. They would bring in 100% of overseas genes in a single generation. On the other side, enormously higher costs per live-born calf mean that the technique is only employed when the stakes are high – usually the possibility of selling the results of the operations at high prices. There is little justification for the costs and disruption where the aim is to improve performance in commercial milk production. Furthermore, the gradual build up of overseas genes from repeated use of imported semen (50%, 75%, 87.5%, etc) allows nutrition and management to adapt to the increasing potential, and give the herd owner the opportunity to decide that, say 50%, or 75%, is far enough.

8.2 HEALTH CONTROLS

It would be expected that all semen imports would come via the United Kingdom, and therefore already conform to EU and UK health requirements. Since the Island is currently free from several diseases that do exist in the UK, the States Veterinary Officer may well wish to impose additional conditions in order to safeguard this position.

Nevertheless no screening method can be 100% effective and it is recommended that a health recording scheme should be introduced **before** any importation is allowed. This should be quite feasible considering the small number of herds involved. They are all attended by two veterinary practices and all participate in a single computerized milk-recording scheme. Computer-based health recording schemes have existed for several years (e.g. DAISY) so there is some UK experience in addition to much more Scandinavian familiarity with compulsory schemes.

The benefits should be the rapid identification of new problems, microbial, genetic or metabolic, so that an appropriate action can be taken based upon the full facts. (For example, deteriorating fertility with increasing milk yield). Furthermore the accumulated data should prove valuable in learning more about the genetic basis for a variety of health problems at a time when there is increasing interest in selection for disease resistance. The Island could thus again contribute to the future development of the worldwide breed through the much more complete recording which is possible in its physically (if no longer genetically) closed situation. What is more, the fact that the Island would be genetically closer to the other main strains in the breed would make its relevance even greater.

8.3 PURITY CONTROLS

The issue here was already discussed in Section 7.4 – what standards of breed purity should be imposed by RJAHS on imports and subsequent registration of progeny in the Island herdbook?

From the point of view of improving the Island's cattle, there is little point in imposing restrictions which are more severe than those in the overseas herdbooks. All individuals (cattle and humans) owe some of their genetic potential to past crossbreeding, and if breed identify has been maintained through a three- or four-generation grading up scheme, then any surviving foreign genes may well prove advantageous.

Nevertheless, if there is to be an issue around the unique status of the Island's cattle, then it may be necessary to only allow importations from bulls whose every ancestor can be traced on paper back to the Island providing this does not prove too restrictive. Some investigation (both of the potential exclusions and herd owner opinions) would be useful before Council takes a decision on this.

8.4 GENETIC CONTROL

The recommendation is that all Island herd owners should be treated exactly like their counterparts in the UK, and permitted to source semen from any country and from any sire within that country, which is able to satisfy the veterinary and herdbook regulations. The herd owners who were surveyed expressed little willingness to be told to which bulls their cows should be mated, and even limiting their choice to a panel of 'approved bulls' would surely prove unpopular with some. (Nevertheless, such a scheme is outlined in Section 9).

Semen would be on offer from a variety of sources, backed up by the usual modern marketing methods. Some will object that agents and salesmen will thus take over too many of the selection decisions, but that is up to the

herd owner. Most are now running substantial businesses and willingly accept responsibility for selecting the appropriate buildings, equipment and feed supplier. They should be equally willing to select their herd sires, or at least to choose the advisers to whom they delegate this responsibility. Their decisions will influence the average quality of the total Island 'herd', but they will not be holding back anyone else's progress as in the past, since all would now be free to import.

8.5 IMPROVEMENT GOALS

The discussion on this subject in Section 6 concluded that, if there were to be an Island-wide co-operative improvement programme, there should first be detailed discussions on the weights to be given to each trait, so that they could then all be combined into a Total Merit Index. Even if individual herd owners are given the freedom to decide which overseas bulls to use, this procedure is still strongly recommended for those who see their role as supplying the Island's requirements from their herds. This is the most efficient way of using the selection procedure to maximise genetic progress in the chosen set of goals. Professional help will be needed to derive the Index weights from MDC Evaluations or one of the research groups.

Those herds which are determined to plough their own furrows, and attempt to win reputations as sources of breeding stock for overseas sales, may embrace different goals. They will no doubt continue to back their own judgement in combining the many sources of information – PTAs, linear assessments of type, show ring success, pedigree. They will continue to ignore the contributions of genetic theory and back their hunches. Theirs are the methods which successfully evolved the breed in the past, but they need to realize not only that their customers have changed (and now demand commercial performance) but that they are now competing with technically advanced schemes run by large scale co-operative or private businesses.

8.6 BREEDING POLICY AT HERD AND ISLAND LEVELS

There are three separate components of genetic improvement which Island milk producers could utilise:

- the first is to catch up with the average gains already made in overseas strains (estimated in Table 4.2)

- second, the existence of proven bulls with PTAs well above the average for their strain

- third, these larger overseas strains are continuing to make annual genetic gains of 1 to 2% per annum.

What rate of genetic progress could reasonably be expected in an Island herd? Progress in the first generation from imported semen is the easiest to predict. For example, using the top 10 UK-tested bulls (ranked on £PLI) in the May evaluations, but rejecting any which would depress percentage fat or protein, one would expect the first crop of daughters to have increased milk yields in first lactations of some 400 litres or 10%.

In the next generations, continued use of imported semen should give a further boost of 5% before settling down to capture the annual rate of

improvement (1 to 2%) in the source strains. Notice that the recommended policy is not just to bring in semen for one or two years and then close the doors again and rely on a within-Island improvement programme. To do so would bring in some rapid benefits, but would then come against exactly the same problems which have kept progress in recent years to such low levels. What is being proposed would be a total, and probably permanent, change of policy.

There would be no need to continue a formal bull testing programme. The results of semen use would be routinely tracked through the normal calculations by MDC Evaluations (PTAs and genetic trends).

It seems unlikely that any herd owner would just want to convert his present herd as quickly as possible into a complete model of one of the overseas strains. This could be simply accomplished by blanket coverage of all females with semen from that strain to produce half, then three-quarter, then seven-eighth cattle.

Much more probable would be the use of imported semen on a proportion of the females, while continuing to breed others to Island bulls, so that the progeny could be compared within the same environment and management system. Even though the results are highly predictable, it is likely that breeders will proceed with a degree of caution. Experience in Guernsey showed that, from the time that semen was first imported in 1977, the 1996-born heifers still contained on average 43% of Island genes. There is reason to believe that imported genes would come in faster and play a greater role in the Jersey Island herd since there is a small but continuous supply of new proven superior bulls available from the relatively large overseas programmes. By contrast, there have been very few proven Guernsey bulls available which the Island (or UK) herds wanted to use.

It could be anticipated that different herds would identify bulls to achieve specific goals in their own herds, but then find other bulls, perhaps from other strains, to breed the next generation. There should be existing experience of using semen from different countries within UK herds, and Island farmers would be well advised to visit the mainland to see the results for themselves before committing to purchase significant quantities. They may need assistance in understanding the ways in which bulls are evaluated and information is presented. David Hambrook has experience in this area and the RJAHS should make use of him for this work in the early years. Indeed, one of the interviewed farmers made a case for training sessions in modern animal breeding.

Jersey's cattle need not come to resemble any one of the major overseas strains, but could combine different features in a way that would best fulfill the Island's specific goals.

8.7 RESOURCES AND INFRASTRUCTURE

If this radical policy change is adopted, there will probably be a range of responses. A few herds will resolutely oppose the use of imported semen and continue to try to maintain an 'Island-only' policy until they are persuaded that the dangers can be avoided, they run out of unrelated bulls, or they cease trading. Others will want to put their entire herd to imported semen in order to make changes as quickly as possible. The majority will adopt a mid-way policy to begin with. This means that there would need to

be supplies of semen from both imported and Island bulls available. While more of the larger herds may wish to train someone to manage their own services, there would surely remain a need to have two or three trained inseminators. These might in future be employed by RJAHS or they might become an independently-owned service. No doubt semen agents, local or UK based, will emerge to source semen from overseas bulls and get the necessary veterinary clearance in conjunction with the States Veterinary Officer. A Working Party Report in early 2000 noted that fewer than 5000 units of semen were used annually (and the cow herd has since fallen by one fifth) so that the total import requirement will be only a proportion of this. There would presumably be advantages from co-ordination of these imports to keep down transport and administration charges.

The requirement for semen from local bulls would pose greater problems. The previous collection centre no longer exists. It would probably be uneconomic to construct a new full-facility centre for the reduced demand. It might be necessary to adopt a combination of on-farm collection and processing in a simple laboratory (as already suggested in the 2000 report on AI in Jersey). Alternatively, it might be possible to send Island bulls to a centre in UK for semen collection and processing, and then import that semen back into the Island. The problem would be to know in advance that sufficient units would be used in the Island since cost per unit is volume sensitive. The system is currently being investigated in conjunction with the previous Jersey Bull Proving Scheme, but forecasting future sales might be difficult and there is the question of who would finance such a venture. The likely result would surely be a greater reliance on natural service.

This is an example of the degree to which changes of organization and attitude would be needed. If the dairy industry decides to move away from a centrally organised breed improvement programme (even one which many herd owners have only partly supported) and opts for a complete 'laissez-faire' approach then some previous services may become uneconomic through reduced demand.

There would be a requirement for short-, medium- and long-term semen storage. Short-term needs are presumably covered by the current equipment. Medium-term storage needs would be new: to provide a buffer of sufficient imported semen (including any needed from Island bulls collected in UK) to guard against interruptions to the regular supply chain (as would have occurred during the recent Foot and Mouth Disease outbreak in UK). One year's back up would be needed. It would be in the herd owners' interests to always use the best up to date semen, and hence any reserve supply would get steadily more out of date. This might not matter too much if it were only viewed as an emergency back-up, but presumably it should be periodically reviewed and the oldest replaced. The loss must be viewed as an annual insurance premium.

Long-term storage is needed to preserve semen from historic and current bulls in case it might be needed in future to help rectify problems. In particular it could retain the genes of the current population in a useful form and help to answer the fear that unknown but valuable genes might be lost when imported genes replace them. It has been said that there are currently between 200,000 and 400,000 units in store. These should be reviewed, and after some disposals there would surely be sufficient equipment to contain new collections.

Owing to the importance of this 'museum' it might be worthwhile dividing it between two locations, perhaps one in UK for additional security.

Professor John Woolliams from the Roslin Institute, who has made a study of the problems of effective genetic conservation, including advice to FAO, has recommended that a DNA bank should be established before any non-Island semen is used. This could conveniently be based upon blood samples taken from all current cows. It may not be necessary to go to the expense of DNA extraction. Instead the blood could be kept in 'buffycoat' form. Such a bank might be a useful way of allowing the Island's dairy industry to use more efficient cows while preserving for posterity the genetic make-up of the current herd. Clearly, specialist advice would need to be obtained for such a project and it would be worth enquiring if any world conservation body (e.g. FAO) could provide assistance, both financial and logistic.

It was mentioned in Section 8.2 that not only would the current milk recording scheme (or something similar) be needed, but it should be enhanced to cover breeding and health records also. Input should come from herd owners and their staff, inseminators, milk recorders, Jersey Milk and veterinarians. Such full recording should be mandatory and perhaps be linked to States payments (cross compliance) as a means of ensuring it is done efficiently.

9. Recommendations. 2. The Second Option

9.1 A REGULATED SCHEME

If such an unregulated importation policy is thought to be too radical by the Council or members of RJAHS, then a second option would be to adopt a common improvement programme for all Island cattle based on imported semen but controlled by RJAHS. It might work in a similar way to the previous JBPS, in that the Breed Improvement Committee would select panels of bulls based on whatever evidence they could gather, arrange for the semen to be delivered to the Island, and manage its allocation to members.

9.2 IMPROVEMENT GOALS

A vital first step would be to generate discussions on a new definition of what should constitute genetic 'improvement', as outlined in Section 6. It would greatly help if agreement could be reached on a Jersey Merit Index or total score which brought together all traits of importance to milk producers, Jersey Milk and the Island's citizens. Available proven bulls from all sources would then be ranked on this Index and semen purchased from those at the top.

Individual herd owners would naturally prefer some bulls over others, and should be allowed to exercise a choice. Nevertheless, the Committee would want to carry the responsibility for trying to achieve the agreed goals for the overall Island 'herd'. Since future bulls could continue to be imported, rather than being the Island-bred sons of earlier decisions, the dangers of inbreeding could be easily avoided.

9.3 METHODS

The Committee should confine itself to overseas bulls with high reliability proofs and the information published by MDC Evaluations could be supplemented by overseas visits. The Committee's task would not be easy since it would have to try to satisfy quite divergent opinions, and it would probably need firm orders before semen was actually purchased. Its members would also get involved in advising some herd owners on their choice among bulls. The required resources and infrastructure would be the same as for Option 1.

Council may feel (as does the author) that there is little real advantage in trying to control semen imports in this way, since the potential exists for a lot of disagreement. Option one, where the responsibility rests clearly with each herd owner, may be thought preferable.

10. Recommendations. 3. The Third Option

If importation is once again ruled out by the Council, members of RJAHS, or the States, then the fall-back position is to run a new within-Island selection scheme. It is perfectly possible to run an efficient improvement programme in a closed population as small as 3,500 cows. The nucleus herds or flocks employed by the successful international breeding organisations (pigs and poultry) will usually be smaller (often much smaller) than this. One obvious advantage they have are much higher female reproduction rates which permit more intense selection among candidates. But the crucial point is their complete control of all breeding decisions. This contrasts with the more than 30 decision-makers who control the Island's dairy cattle in Jersey. So a cooperative scheme in the Island could not be a world beater, but it could create useful progress if well-designed and run.

10.1 THE BLUEPRINT FROM THE ROSLIN PROJECT

Fortunately there has recently been a three-year study, financed by the UK's Milk Development Council (budget over £100,000), of alternative improvement programmes for numerically small breeds of dairy cattle. The project was specifically directed towards the Jersey, Guernsey, Ayrshire and Shorthorn breeds (and later extended to help the British Friesian section of the Holstein breed). Each of these poses different specific problems, but there are common elements. Unfortunately the English Jersey Cattle Society decided not to participate, but the Guernsey breed (both the UK and Island populations) had a major involvement.

The project was coordinated by a prominent theoretical geneticist, Professor J A Woolliams of the world renowned Roslin Institute in Edinburgh. The author was involved throughout, acting as intermediary with the two Guernsey associations, helping to plan the theoretical studies and then to interpret the conclusions back to the breeders. He then helped to derive and begin to implement the Global Guernsey Breeding Plan (so far for the UK and the Island) based upon an agreed overall set of goals – the Guernsey Merit Index.

As an introduction to the recommendations for a new improvement scheme within Jersey Island, some of the conclusions from Prof Woolliams' final report (available in full) can be summarised.

- Progeny testing is very effective for numerically large breeds
- Progeny testing for breeds with small census size is much less efficient than with numerically large breeds

- Young bull schemes (which rely on the rapid turnover of generations without returning to proven bulls) are much less affected by census size, and can be at least as competitive as progeny testing

- Creation of a single managed unit (nucleus) is unlikely to be effective (without additional reproductive technologies) unless it is over 800 cows. With a full MOET scheme (Multiple Ovulation and Embryo Transfer) as few as 100 cows could in theory provide gain equivalent to the non-nucleus schemes, but with huge demands on advanced reproductive technology at great cost.

10.2 USING YOUNG BULLS, NOT TESTING THEM

The recommended design for a new closed population scheme for the Island's dairy cattle might not look very different from the 15-year JBPS, and would not involve huge practical changes. It would however require a significant change in attitude and approach. The scheme would drop the past emphasis on 'testing' or 'proving'. Instead, the panels of carefully selected young bulls would be **used** as widely as possible to sire the majority of replacement heifers and the future panels of bulls. This follows from the acknowledgment that since there is only a small number of heifer records each year, then 'test' bulls would either have to be few in number or each have too few daughters to achieve an adequate evaluation.

Experience on the Island surely bears this out. Only 10 bulls were 'tested' per year in an attempt to get accurate proofs, and even fewer (7 or 8) achieved a reasonable number of recorded daughters. But this has meant that very few improving bulls can be revealed. Nor can the exceptional ones be exploited much more (by breeding more sons and lots of daughters) because of the inbreeding that would result. Several herd owners have voiced their fears that there may have already been excessive concentration on the few plus proven bulls from the JBPS and their sons. While these fears do not yet seem justified by the current inbreeding in the Island herd, they are nevertheless a threat in any such scheme. The features and principles of a new scheme are set out below.

10.3 FEATURES OF AN IMPROVEMENT PROGRAMME BASED ON YOUNG BULLS

Consideration should be given to achieving maximum involvement with herd owners while reserving sufficient central control. This control should be based upon existing or new RJAHS rules, and States rules and financial inducements. This is the essential pre-requisite. Herd owners must agree to give up some of their own individual freedom for the common good.

The overall improvement goals and their relative weights should be agreed. From this can be derived the Total Merit Index from all the measured traits and arrangements made for MDC Evaluations to calculate this JMI routinely and rank both bulls and cows in JMI order.

The Breed Improvement Committee should identify female candidates for contract matings based primarily on JMI irrespective of age (including maiden heifers and first calvers). Some of these may have modest actual performance because they have been milked in herds with poor management or low inputs. It must be accepted that there will be no accurately proven bulls available with high PTAs. The highest ETA/PTA

bulls should be used for contract matings, as soon as possible. Many will be among the latest panels of young bulls. The engine driving the programme is the accurate selection of the best bull dams early in their lives. These then pass their genes to the population through their sons who must also be used while still young.

Why is this scheme rejecting the alternatives which were recommended in earlier years by Dr Allan? First, he dismissed 'pedigree selection' (or ETA) as an inaccurate procedure for identifying animals of superior merit. That may be so when such selection relies only on the average merit of sire and dam. Today the BLUP statistical procedures bring together all possible sources of information (ancestors, parents, sibs, progeny), weight them appropriately and, what is more, update the PTA quarterly as more records accumulate. They also adjust for environmental effects more adequately. And genetic progress is a function not only of accuracy, but also of speed of decisions. Thirty years ago there was little alternative to waiting patiently for a bull to become proven (good or bad) through his progeny. But today a reasonable decision can be taken much earlier. Add to this the facts that in such a small population many 'tested' bulls never achieve an accurate progeny test, and that with so few tested there is little chance of revealing real high fliers, and progeny testing is seen as an unnecessary and expensive exercise.

Dr Allan also favoured the idea of using MOET technology to produce groups of ET full sisters whose performance would decide whether their ET brothers were used. But as these theoretical ideas were tried out in several countries (including Genus in UK, CR Delta in the Netherlands) it became obvious that their success depends upon the extremely efficient use of advanced reproductive technology – which implies much deeper pockets than could be found in the Jersey dairy sector!

It is even questionable whether one can justify the ET programme previously practiced in Jersey to guarantee a son from each contract mating. The results showed that on average each selected 'bull dam' produced one son and one daughter at a cost of £1500-2000. The alternative is to identify twice as many 'bull dams' which would of course lower the average merit of those actually leaving sons, but with a considerable saving of cost and disruption. The money might be better spent using every means to ensure that every chosen dam is mated to chosen sires, and all resultant bull calves are properly reared.

10.4 RESOURCES AND INFRASTRUCTURE

Bull-rearing and semen collection and processing facilities would be needed as before. The total requirement would be nearer 5000 doses per year than the previous target of 22,500. RJAHS should reconsider the practice of having only a single annual panel (of 8 or 10 bulls). Smaller groups introduced quarterly or half-yearly might need smaller facilities and reduce the generation interval.

Payments to bull-breeders should be re-considered. If it really is a co-operative programme then surely the breeder need only be reimbursed for his specific **costs** in bull rearing? The JBPS Working Party report stated "Financial incentives for individual dairy farmers are needed in order to encourage them to allow their superior bloodlines to be used on an Island-wide basis'. A different way of seeing this is as follows. It is not a

'bloodline' which is provided but an individual bull calf, usually the result of a contract mating of that farmer's cow with someone else's bull! It should be an honour to be asked for the calf and to contribute to the improvement of the Island's cattle, not an opportunity to extract cash out of the States or one's fellow farmers.

It might prove more economic to ship the selected young bulls to an English AI stud for semen collection though this would involve permission to import (only) their semen back into the Island. There have already been several reports on the types of AI resources needed for different scenarios and these need not be repeated here.

Naturally, the present milk and herd recording service should be continued and extended to cover full fertility and health recording as in the other two options. Equally, the Island should continue to support the work of MDC Evaluations Ltd in order to have its cattle genetically evaluated.

10.5 PRINCIPLES OF A YOUNG BULL SCHEME

The young bulls are not used just to get a number of test-matings before being laid off for several years and then perhaps re-used. They are the best current bets, and should therefore be used as widely as possible, and as quickly as possible. If they were correctly chosen then they should all be well above breed average, but of course some will disappoint when their proofs eventually come through. These bulls will be found to have left fewer daughters and no selected sons, whereas the best will make a disproportionately large contribution to future generations. The system would maximise the chances of raising the mean of the Island's cattle by perhaps 1% annually. **This** should be the aim of the programme.

Herd owners will want to serve at least a proportion of their heifers by natural service, for convenience. Try to ensure that as many as possible of these natural service bulls are young sires recently used by AI within the main programme, or surplus animals from the contract matings. Encourage the selection of replacement heifers from the youngest cows and heifers since these should be genetically the best and most up to date. The rate of progress would be maximised by taking bulls out of the best possible Island cows (ranked on the agreed improvement objectives) and by reducing the generation intervals to the minimum.

The economics of milk production will, of course, be improved by keeping long-lived cows but these two objectives can be reconciled. The best cows should indeed be kept milking for as long as possible, but they should contribute a bull calf (and heifer calves) from their early calvings. The young bulls then inject their mothers' genes quickly into the population before themselves being replaced.

10.6 AVOIDING INBREEDING

The whole Island cattle population could be safely bred to only 20 young bulls per year providing that not too many half-brothers were included. (In the past 12 months calves were registered by 128 sires!). Recent theoretical work (by Prof Woolliams and others) has at last provided methods for maximising rates of genetic change at a pre-determined rate of inbreeding. Guidelines could be used to enable the Island to achieve much more effective selection and still avoid inbreeding problems while remaining

closed. If RJAHS decides to adopt this third option, or indeed the second option, then specialist help would be needed to evolve an acceptable and workable scheme while not compromising its efficiency too far.

10.7 COULD IT BE RUN EFFICIENTLY?

Some herd owners have criticised such an improvement programme on the grounds that all herds would need to accept 'bog standard' genetics, with no room for flair or originality! It is certainly true that it does imply considerable uniformity in the genetic levels of participating herds. But it would surely be better for all Island herds to make a reasonable annual rate of genetic progress than to allow a free for all, where a few herds try on their own to achieve distinction with no guarantee of success, but most have to accept the certainty of very little progress? The breeders of Danish Jerseys and Dutch Holsteins may have given up much of their individuality but they have all gained enormously from the success of their co-operative breed improvement programmes!

Back in the early years of the JBPS Dr Allan advised that "each breeder should have the freedom to attempt to satisfy the needs of his chosen segment of the market" and "I see no need for corporate regulation" in deciding which bulls are the proven ones. That may have been the only acceptable message to the 103 herd owners just starting to learn the new disciplines of a whole-Island improvement scheme, but it was certainly a recipe for very little progress. If the goals cannot be agreed, how can the enterprise succeed?

Herd owners in Jersey need to recognize that if they cannot agree to fully support an Island-wide improvement programme, then they will never run a competitive closed scheme. They would also find it difficult to use imported semen consistently. The only way that Jersey's cattle can all be improved in the presence of strongly conflicting ambitions is to allow each to import within the constraints necessary to exclude the simultaneous introduction of disease. In this scenario (Option 1, Section 8), the 'master breeders' could try to achieve worldwide success without prejudicing the ability of the majority to improve their more limited Island-focused goals.

11. Semen from Specialised Beef Breeds

If the decision is made to import semen of the Jersey breed from some of the overseas strains, then a case could also be made for addressing the problem of surplus purebred Jersey calves which have rather low value as beef or veal animals. If semen from some of the specialised beef breeds were also allowed to be imported, then the value of some calves could be improved thus helping to restore the Island's dairy herd to profitability. There would have to be strict conditions governing the use of such semen. A minimum would be the requirement to notify the calf's birth and slaughter dates and to agree not to use it for breeding. (Perhaps only colour marking breeds should be allowed.)

Such crossbreeding is a common practice in UK dairy herds, but is currently only feasible where the fertility rate is high and where longevity of the cows is good, since it obviously reduces the number of purebred heifers available as replacements or for expansion. If it becomes possible to pre-determine the gender of the purebred Jersey calf so that heifer calves can be guaranteed from the best cows, (except for guaranteed bull calves from contract matings), then at least half the cows could be cross-mated and beef-crossing would become much more attractive. Sexed semen from some breeds is now available from the Cogent breeding company, but the technology is in its infancy and there are still problems:

- sexed semen is only available from a limited number of bulls
- calving rate is probably lowered because many fewer sperm are included in a dose
- the cost is higher, both inherently because of the processing involved, and temporarily because there is only one product on the market
- scientists have many different ideas on how to pre-determine gender. To date only one of these methods has proved commercially viable (backed by the resources of the Westminster Estates). The current method is slow (relative to the millions of sperm to be sorted) and low-yielding. It may not be possible to increase the efficiency of the separation process much further, and the next breakthrough may have to wait until an entirely new approach to gender control is worked out and commercialised.

It is not thought likely that the use of beef-breed semen would make a major contribution to the financial efficiency of the Island's dairy farms though there could be some plus points:

- there would be fewer calves disposed of shortly after birth, a practice which is distasteful to both farm staff and the general public
- if the early potato industry contracts, there could be more land available for dairy farms (grazing or forage) which could be used for rearing beef cattle

- there could be a new supply of quality beef for Island consumption with a local brand.

If the decision is made to seek States approval for the importation of purebred Jersey semen, the RJAHS should consider carefully whether to also seek permission to import semen from specialized beef breeds at the same time. Because some States members from outside the farming industry might confuse the two requests and might be alarmed by the prospect of, for example, black cattle replacing the popular brown Jersey cattle on the Island, there could be a case for postponing any request for beef semen for a few years so as not to prejudice the more important request.