Performance of New Zealand-bred animals in foreign environments

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ABSTRACT

There is a dearth of useful performance data on exported New Zealand-bred animals. Expectations vary as to what is required of these animals and breed comparison trials involving them in foreign environments are rare. Care must be taken to avoid the 'bigger is better' syndrome in judging the performance of exports. New Zealand genotypes adapt to foreign temperate environments and perform according to level of management. New Zealand dairy cattle, pigs and poultry can perform well in tropical environments if managed intensively. Crossbreeding between imported and local, adapted genotypes of cattle and sheep would seem to be the best way to use New Zealand germplasm in tropical countries. The use of Zebu semen on New Zealand cows to produce tropically adapted crossbreds for export is proving successful but such cattle are unlikely to outproduce exotic × local crossbreds. There is a need for information to enable better choice of breeds for crossbreeding and the development of breeding plans to enable importing countries to make best use of exotic genes.

This paper reports on the performance of New Zealand's exported livestock from the point of view of the consumer. There is not a great deal of readily available, useful performance data and this report is largely based on observation in several recipient countries, on discussion with those involved at the consumer end, and to some extent on data from which the likely performance of New Zealand livestock can be inferred.

Performance Data

What is meant by 'performance' depends upon the expectations of the observer. Information supplied to the enquirer on the performance of imported livestock is often more the product of wishful thinking than of actual measurement, or the performance figures may be inflated by preferential or supernormal treatment given to the imported stock. In very few cases are the data comparable with those from alternative local or imported animals.

Where local, competing livestock are available, it is possible to set up breed comparison trials to evaluate the imports, preferably before commitment is made to ship the bulk of the animals. These trials, done in the recipient country, can be quite simple in design but have rarely, if ever, been undertaken. Only recently has there been an upsurge in interest among animal geneticists in breed or genotype comparisons on an adequate scale. However, the message is yet to get through to those making decisions about livestock imports, often people well removed from the field situation where the animals are expected to perform. The SABRAO animal genetic resources workshop, 1981, lamented the inadequacy of available data on comparative evaluation of the breeds and strains of the Asian and Oceanic region and stressed the need to assess the relative value of different strains or crosses in terms of necessary inputs as well as outputs and of lifetime performance. This can be extended to imported genotypes and the workshop recommended that when exotic breeds or crosses are imported into any country, there should be objective evaluation of them to give guidelines for the future (Barker *et al.*, 1981).

Imported animals are often larger than local animals. Care must be taken to avoid the 'bigger is better' syndrome since this size superiority may not persist into future generations, may indicate lower efficiency, or may simply be inappropriate in terms of feed availability or management skill. Imported animals may be advantaged because of early rearing or disadvantaged because of lack of adaptation compared to local livestock. Breed comparisons are difficult to make because to be valid all animals must be born and raised in the same environment.

Where there are no comparable local livestock, or in situations where the importers are anxious to build up livestock numbers quickly for social or political reasons, mere survival of the imported animals may be hailed as success and the importers may be satisfied with a fairly low level of performance as judged from New Zealand.

Let us consider 3 distinct types of situation with respect to genotypes of exported animals and the environments to which they are sent. Firstly, New Zealand genotypes exposed to similar environments. Secondly, New Zealand genotypes exported to markedly different environments. Thirdly, tropically

adapted genotypes produced in New Zealand for export to tropical environments.

Temperate Environments

New Zealand animals of all the important domestic species have been exported to a wide range of countries. By and large they have performed up to expectations. New Zealand Corriedale sheep have been founder animals for the flocks of Australia, Uruguay, Argentina, Chile and China, while Coopworths, Perendales and Drysdales have found popularity in Australia. Coopworths have also recently been exported to Eastern Europe and the United States. The results of the FAO Friesian comparison in Poland and other evidence such as a comparison of the breeding values of United Kingdom, New Zealand and Australian Hereford sires in New South Wales (Roberts *et al.*, 1982), show that New Zealand genotypes are comparable or superior.

The pasture improvement project at Puno in the Altiplano region of Peru using New Zealand varieties and technology, has shown how improving sheep nutrition potential enables imported Corriedale sheep and their descendants to perform up to New Zealand expectations.

Tropical Environments — New Zealand Genotypes

For New Zealand genotypes in non-New Zealand type environments, there is a record of both success and failure. Tropical experiences going back to the early experiments with Jersey cattle in New Zealand and Fiji (Hancock and Payne, 1955; Payne and Hancock, 1957) suggest that temperate region livestock are unlikely to thrive in the tropics and produce to their genetic potential without considerable special care and attention. There have been some spectacular failures including quite recently the importation into Western Samoa of 319 Hereford cattle as part of an Asian Development Bank project. High calf mortality in particular resulted in a switch to Australian Brahmans for subsequent female importations and the remaining Hereford cows were mated to Brahman bulls to produce crossbred calves for future breeding (Asian Development Bank, 1979). While grade Hereford cattle do produce in environments like that of Western Samoa, Brahman bulls are now being widely used there to produce a suitable Samoan Brahman × Hereford type and there is a wealth of evidence to suggest that only Zebu (Brahman or equivalent) crossbred cattle should be exported to the humid tropics for beef production.

The Highlands sheep management and research project in Papua New Guinea is a good example of the successful export of New Zealand genotype livestock to the humid tropics. The project is located at an altitude of some 1500 m and the tropical climate is therefore somewhat moderated.

Some 1600 ewes (mainly Corriedale and Perendale with some Romney ewes) have been imported. Since 1978, emphasis has been placed on pasture improvement. Lambing performance in the Corriedales and Perendales has improved over the years from under 50% to over 80% and wool production is up to 4 kg per adult ewe. Crossbreeding with the tropically adapted Priangan sheep, which have a shedding type fleece, aims to produce a wool producing sheep adapted to harsher environments for small-holder sheep projects in Highland villages. A recent study (Grossman, 1981) suggests that, while there is some possibility of serious social and environmental problems, the sheep enterprises do make positive contributions to the social, if not necessarily the financial, situations of the owners. General opinion is that the Corriedale is the most successful of the breeds introduced, possibly due to its Merino ancestry.

Some 120 ewes at the Nawaicoba Station in the dry zone of Viti Levu, Fiji, are the descendants of Corriedale and Merino half-bred ewes, Perendale and Border Leicester rams, imported from New Zealand in 1967. Current lambing percentage with a single lambing season is about 85%, and while the Fiji authorities do not seem to consider the sheep a viable commercial proposition they are in fact producing as well as are the Papua New Guinea sheep (Quartermain, 1980).

The performance of the Friesian herd run by the National Livestock Development Authority, Air Hitam, Malaysia, indicates that European-type dairy cattle can produce at normally accepted temperate production levels in the tropics with a minimum of environmental protection, provided that high concentrate feeding and adequate protection from tick-borne diseases are employed. If the market can afford the higher cost of the product, artificially modified ambient environments can enable high dairy production to be attained in virtually any climate. However, much lower levels of production may be quite acceptable if produced at lower cost. The Fiji dairy industry is based on European types of cattle and there are Friesian cattle on Viti Levu with 10 to 12 generations of tropical ancestry. The Fiji Pastoral Company with some 600 cows is quite satisfied with the performance level of Friesians and imports New Zealand germplasm to maintain genetic improvement. It would seem that about 10 kg milk/cow/d is considered satisfactory. Friesian heifers have been distributed successfully in Tonga as house-cows and there are several larger herds but the economic value of these is doubtful given yields of 7 to 8 kg/cow/d (Quartermain, 1980).

Most development programmes for dairying in tropical countries rely on crossbreeding of local cattle with imported temperate-region cattle or with imported germplasm using artificial insemination. Friesian and Jersey semen has been exported to a number of Asian

countries. A nucleus herd of New Zealand Jersey cattle is being used to provide semen for crossbreeding in New Zealand's largest on-going aid project in India at Palampur, Himachal Pradesh. In general, Indian results suggest that about 50% of exotic genes is optimal for dairy production and the effects of using New Zealand semen or bulls indicate a likely 50 to 100% improvement in lactation yields over indigenous cattle (P. N. Bhat, per. comm.). Results from Malaysia show calving intervals of F_1 Jersey and Friesian crosses with Local Indian Dairy (LID) cattle to be shorter than either LID or purebred exotic cows (Jalaludin *et al.*, 1981).

The Jersey × LID would seem to be more popular in Malaysia than the Friesian × LID with the latter said to have more health problems and to be less tractable. However, it is Government policy to favour the Friesian in imports from New Zealand because of its greater size and beef potential.

Because they are normally husbanded under intensive conditions of housing and concentrate feeding, pigs and poultry are less susceptible to environmental stresses caused by climate. Hence it might be expected that New Zealand commercial pig and poultry genotypes might perform competitively in the tropics. Here the competition comes from imported livestock from countries such as Australia and U.S.A. An extensive series of trials in Papua New Guinea compared layer and broiler strains of poultry from major Australian and New Zealand breeders. The New Zealand strains were competitive with the Australian and the eventual choice of an Australian breeder to supply grandparent stock was made on grounds other than productive performance. New Zealand genotypes of both species have been exported to a number of South Pacific island nations, including New Caledonia. The pigs have mainly been of the white breeds (Large White and Landrace) but Berkshire pigs from New Zealand are being used in Tonga for improved village type production systems and there could be a continuing demand for coloured pigs in the South Pacific.

Tropical Environments — Tropical Genotypes

Relatively recent developments in the export of Brahman and Sahiwal crossbred cattle produced in New Zealand have arisen out of the realisation that conventional New Zealand genotypes are not necessarily the most appropriate for tropical production systems. The continuing demand for such cattle, not motivated by the requirements of bilateral aid projects, suggests that they are performing up to expectations. Recent reports from Mexico (Kilgour, 1982) indicate the popularity of Sahiwal × Jersey cattle. In some countries, such as Malaysia, there is such a demand for cattle that there are grave risks concerning nonselectively in choice of imports. New Zealand is in a good situation with the Sahiwal scheme to supply good quality cattle and thus build a reputation for the future. These imported cattle however are unlikely to outproduce crossbred cattle resulting from the use of imported Friesian or Jersey semen on local cows and the use of New Zealand semen in such crossbreeding is a preferred method for boosting dairy production in countries with existing populations of suitable local cattle such as India, Thailand and Malaysia. In the Nong Po Dairy Co-operative, Rajaburi Province, Thailand, Sahiwal × Friesian heifers from New Zealand have similar first lactation yields to locally produced Friesian crossbreds, around 2200 kg. Data from Indian military dairy farms for Friesian × Sahiwal F_1 cattle show a mean first lactation of 2193 kg (Bhat, 1981). Similarly, Brahman crossbred beef cattle from New Zealand may not be superior in the local environment to cattle such as the Angus × Kedah-Kelantan or Hereford × Kedah-Kelantan for low input beef production systems in Malaysia.

Recommendations from Session I of the FAO expert consultation on dairy cattle breeding in the humid tropics, Haryana Agricultural University, India, 12-17 February 1979 (FAO, 1979) are relevant. They read: 'There is scope for limited importation of breeding stock to establish a local nucleus managed under proper conditions which can be a source of animals for use in crossbreeding programmes'; and 'An alternative to importing purebred European cattle would be to import first crosses between improved dairy Zebu (indigenous breed) bulls and European dairy cows. Such systems are being tried out at present; in 1 case the F_1 animals are being bred in Australia and New Zealand for export to Malaysia and Thailand and in another Abondance cows in France are being bred with N'Dama semen. It would be advisable to await the results of these importations before making firm recommendations on this policy.'

It would appear that the choice of breeds to include in these crossbreeding schemes in New Zealand has been dictated more by availability and ease of organisation than by the results of attempts to determine the best breed combination for each particular market. To make this statement is not to underestimate the difficulties of making such attempts. The use of Brahman semen on Friesian cows in New Zealand and by the Fiji Pastoral Company in Fiji to supply heifers for the beef cattle ranching operations of the Uluisaivou Corporation and the Yalavou Rural Development Project was a convenient way to increase the influence of the Brahman breed, an influence which has probably done more to enhance the beef production potential of the Pacific Islands than any other single factor. Efforts should have been made to at least try a smaller, hardier beef breed, such as the Angus, as the dam line (Quartermain, 1980). The use of Brahman bulls on Angus cows in New Zealand

could provide a useful diversification avenue for beef cattle breeders. Simple but adequate scale comparative breed trials could be carried out on some of the larger ranches in the near tropics without causing too great complications in ranch management.

In terms of the availability of genotypes suitable for inclusion in a programme to breed livestock for export, Australia has gained over New Zealand with the establishment of the Cocos (Keeling) Islands offshore animal quarantine station (Dunn, 1982). However, no doubt some of the genetic material now becoming available to the Australians will eventually become available in New Zealand.

Future Breeding Policies

A major unresolved problem in most importing countries is to develop breeding plans to take full advantage of the potential contribution of the introduced genes. New Zealand exporters may well be satisfied with adequate levels of performance by the exported animals but unless this genetic material is used constructively there will be a high level of wastage. Probably what will happen in most situations is the gradual evolution of new local breed types based on the gene pool existing at the time livestock numbers have been built up to optimum levels governed by feed and other resources. In this event, the role of exporters may well diminish with time unless it can be demonstrated that the continuous supply of superior crossbred animals, purebred animals or semen will give a substantial advantage in terms of economic production over a national or regional closed population. Such may prove difficult to demonstrate.

REFERENCES

Asian Development Bank 1979. Western Samoa beef cattle pilot project. Project Completion Report. mimeo, 78 pp.

Barker J. S. F.; Mukherjee T. K.; Turner H. N.; Sivarajasingam S. 1981 *Eds*. Evaluation of Animal Genetic Resources in Asia and Oceania. *Proceedings of the Second SABRAO Workshop on Animal Genetic Resources held in Kuala Lumpur, May 5-6, 1981*. Society for the Advancement of Breeding Researches in Asia and Oceania.

Bhat P. N. 1981. Evaluation of dairy cattle and river buffalo breeds/crossbreds of the SABRAO region. Paper presented at the Second SABRAO Workshop on Animal Genetic Resources, Kuala Lumpur. mimeo, 21 pp.

Dunn K. 1982. Cocos (Keeling) Islands animal quarantine station. *Animal quarantine* **24**: 2-7.

FAO 1979. Report of FAO expert consultation on dairy cattle breeding in the humid tropics. Food and Agriculture Organisation of the United Nations, Rome. 46 pp.

Grossman L. S. 1981. Smallholder sheep projects and development in the Highlands of Papua New Guinea. Report to the Department of Primary Industry, Livestock Division. mimeo, 57 pp.

Hancock J.; Payne W. J. A. 1955. The direct effect of tropical climate on the performance of European-type cattle. I. Growth. *Empire journal of experimental agriculture* **23**: 55-

Jalaludin S.; Jainudeen M. R.; Mahyuddin M.; Baharin K. 1981. Reproductive performance of cattle in Malaysia. Paper presented to the Fourth International SABRAO Congress, Kuala Lumpur. mimeo, 1 p.

Kilgour R. 1982. Report on a visit to Mexico, Venezuela and the U.S.A., November-December 1981. New Zealand Ministry of Agriculture and Fisheries. mimeo, 16 pp.

Payne W. J. A.; Hancock J. 1957. The direct effect of tropical climate on the performance of European-type cattle. II. Production. *Empire journal of experimental agriculture* **25**: 321-

Quartermain A. R. 1980. South Pacific Agricultural Survey 1979. Sector Paper on livestock. Asian Development Bank, Manila. 66 pp.

Roberts E. M.; Scott R. F.; James J. W. 1982. Comparison of breeding values of United Kingdom, New Zealand and Australian Herefords. *Proceedings of the World Congress on Sheep and Beef Cattle Breeding. Volume I: Technical. Eds* R. A. Barton and W. C. Smith, Palmerston North, pp. 475-479.