PLG - IMPLICATIONS OF ACROSS-FLOCK GENETIC INFORMATION ON THE FUTURE STRUCTURE OF A TERMINAL SIRE GROUP BREEDING SCHEME

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SUMMARY
PLG is a successful nucleus-based group breeding scheme now employing across-flock evaluation to compare animals within the group and itself with other flocks. This challenges the previous simple rules for group membership and means that all aspects of group operation become more focussed on achieving cost-effective genetic gain. In this environment maintaining a nucleus flock is a realistic option provided that PLG operates as a tightly integrated breeding business. If this cannot be achieved, investment in a nucleus-based system is not justifiable and is unlikely to be sustainable. Similar challenges are now facing most breeding operations across the Australasian sheep industry, and are certain to mean rapid change in organisation within the breeding sector.

Keywords: Across-flock evaluation, nucleus schemes, meat sheep

INTRODUCTION
This paper is a companion to Eppleston and Banks (1997), which examined trends in genetic merit and between-flock variance in the PLG breeding program. It was concluded that both the genetic trends and the increased between-flock variance ultimately reflected differences in level of commitment to the group and to achieving genetic progress. Such differences are not uncommon within group breeding schemes, and a number have in the past failed on just such within-group differences. The availability of across-flock evaluations could exacerbate these tensions: this paper briefly examines some alternatives for future operation of the PLG program.

PLG - BACKGROUND AND COMPETITIVE POSITION
PLG was formed as a vehicle for industry adoption of the results of the University of New South Wales White Suffolk development program. The structure adopted was a trust of some 40 members each contributing elite young ewes to a nucleus flock and drawing in return balloted rams. Theory suggests that this structure is sound in genetic terms, provided that selection is accurate and objective, and provides a means for sharing costs and benefits in a simple way.

Until LAMBPLAN Central Progeny Tests (CPT) and Across-Flock Evaluations, PLG had essentially no way to evaluate the program in any terms other than member satisfaction. During this period, PLG operated almost entirely to produce sires for members’ own use - PLG was not competing in the ram selling market.

During the 1990’s, a number of changes occurred in the environment of PLG. These include the following:

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widespread adoption of LAMBPLAN strengthened demand for objectively-described flock rams
across-flock comparisons became available, through CPT (1991 onwards) and across-flock evaluation (1995 onwards)
US Suffolks and Texels were imported, and began to be infused into Suffolk, White Suffolk and Poll Dorset flocks

At 1997, the group finds itself with:

- sound data on the performance of the group as a whole and of every member
- sound data on the relative merit of PLG and competitors seedstock
- a strengthening demand for PLG products, but a more competitive market for seedstock

This situation has lead to considerable reassessment of group operations, including the value of maintaining a nucleus flock.

The proper basis for such evaluation is in comparison of PLG product merit with competitors. Figure 1 illustrates the genetic trends for the PLG nucleus flock, members' flocks and the White Suffolk breed as a whole.

Figure 1. Genetic trends for 60:20:20 index in the PLG nucleus, members' flocks, and the White Suffolk (WS) breed.
From Figure 1 it can be seen that:
- the nucleus has averaged 3.47 index points gain per year (0.35 index standard deviations per year)
- the average genetic trend across members’ flocks is 1.46 index points per year
- average genetic trend across the White Suffolk breed is 1.47 index points per year
- over the drops 1988-1991, the difference in genetic merit between nucleus and members’ flocks averaged 1.5 index points, or 1 year worth of genetic gain
- over the drops 1992-1995, the difference in genetic merit between nucleus and members’ flocks averaged 10.9 index points, or 3 years worth of genetic gain in the nucleus
- flock rams generated from members’ flocks are competitive with average White Suffolk rams, but the nucleus is more than 1 genetic standard deviation superior to the average of the White Suffolk breed.

The key points that emerge from this analysis are that:
- PLG as a group has been making genetic progress
- that progress has accelerated, particularly in the nucleus
- the increased nucleus:members lag is restricting the competitive advantage of PLG

FUTURE OPTIONS FOR THE PLG PROGRAM
PLG has used a simple system for ewe contributions to, and ram allocations from, the nucleus flock, following standard theory for open nucleus schemes (James, 1977). The availability of across-flock evaluations means that:
- all ewes within the group can be directly compared with each other
- members can compare ram sources within and outside the group

This allows composition of the nucleus flock to be solely based on genetic merit, and to no longer involve equal contributions from all members, and allows members to compare all sources of rams for their own use. An alternative use of this selection capacity is to move to a “distributed nucleus” system, where elite parents are mated within members’ flocks. Thus PLG has 3 broad options for its future operation:
- continue as at present, but with more accurate selection of nucleus replacements
- continue with the present system, ignoring between-members’ flock genetic differences
- move to a distributed nucleus

Each option involves benefits and costs to PLG and its members, and each raises major questions about the role and value of the central nucleus flock. This is the major cost item for the group and has been the primary source of genetic progress. Having across-flock evaluations raises important questions about the value of this investment. Maintaining a nucleus flock will only be justifiable if:
- PLG wishes to apply advanced measurement and/or reproductive technologies at maximum cost-effectiveness - these would be in an elite nucleus flock
costs of measurement and selection can be reduced in members' flocks (compared to the nucleus), or costs/benefits of membership are directly tied to genetic merit in the members' flocks

competition in the market for genetic material becomes dependent on cost per unit of genetic merit (if not, there is no incentive to invest more or less in measurement and selection)

A nucleus flock is the most sensible option if PLG wishes to continue achieving high rates of genetic gain and to multiply these gains through increasing numbers of ram sales, and to operate as a tightly integrated business. A less tangible benefit is that the operation of the nucleus provides a focus for members' activities and involvement.

**CHALLENGES FOR PLG AND IMPLICATIONS FOR MEAT SHEEP BREEDING**

Exploiting across-flock evaluation and maintaining group cohesion within PLG will require significantly more attention to the "business" of meat sheep breeding than PLG has to date involved. Evolution of the group over the last 1-2 years suggests that these challenges are being addressed:

- rules and responsibilities of members are changing
- new mechanisms for movement of genetic material within the group are being implemented
- group marketing is becoming more professional and more closely linked to genetic merit of animals

Many of these challenges apply to other breeders and breeding groups across the sheep meat industry. For example, rules of membership/association of breed societies are challenged by increasing genetic trends being achieved by some flocks, by increasing disparity in flock genetic merit within breeds, increasing uptake of new reproductive technologies, and by rapidly increasing market focus and professionalism of seedstock marketing.

Use of LAMBPLAN is simplifying genetic decision-making across the sheep meat industry. This means that competitive success in the seedstock sector of the industry will increasingly depend on sound management of the breeding business.

**REFERENCES**
