PIGBLUP - Version 4.00

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Introduction

PIGBLUP has undergone continuous development since version 1.0 was released in 1988.

The number of traits available for analysis has increased regularly over the last 10 years. Version 1.0 of the program performed a multivariate evaluation of lifetime daily gain and backfat and a univariate evaluation of number born alive (Brandt *et al*, 1988). In version 1.1 the number of traits in the multivariate analysis was increased to four, with feed conversion ratio and daily gain on test (Long *et al*, 1990). Carcase traits (lean meat yield, carcase fat depth and carcase muscle depth) were included in version 2.0 (Long *et al*, 1992). Litter weight at 21 days of age was included, as an additional univariate evaluation in version 3.0 (Henzell, 1995). Breeders can choose which combination of traits they analyse.

Better models and computational methods have been implemented over the years. In version 2.0, the algorithm used in the multivariate evaluations was changed in order that the program could efficiently analyse the increased number of traits and larger populations. Version 3.0 saw the inclusion of genetic grouping to account for differences in the genetic level of animals imported into the population at different times.

Version 4.00 continues the tradition of improving PIGBLUP and incorporating the latest technology into the genetic evaluations. In addition, it positions PIGBLUP for continued development into the future.

Major new features of PIGBLUP version 4.00

1. *FORTRAN90.*

One 'invisible', but very important, feature of PIGBLUP version 4.00 is that the code has been ported from FORTRAN77 (F77) to FORTRAN90 (F90).

F90 was the first major upgrade to the FORTRAN language since F77 was adopted as a standard. As a result, F90 offers many new features which have been developed in the interim period as part of other programming languages. In order to avoid FORTRAN becoming outdated again, an ongoing development plan has been put in place.

The benefit for PIGBLUP users of switching to F90 is that the program is now written in a modem, powerful programming language which will be supported well into the future. This allows us to continue development of the program confident that our code will not become redundant in the foreseeable future.

2. *Evaluation ofPrimeGro® records.*

PrimeGro® is a PRDC development involving Bunge Meat Industries Pty Ltd and Gropep Pty Ltd. The trait PrimeGro is an early-life record of Insulin-like Growth Factor 1 (IGF1). When recorded at a young age, a blood sample can be taken between three and five weeks of age, IGF1 is genetically correlated with major production traits, in particular feed conversion. As a result the breeder can make use of this trait to:
- select animals to go onto performance test (two stage selection);
- provide information on feed conversion ratio if the breeder does not have feed intake recording facilities;
- provide additional information on the production traits in the genetic evaluation.

Brian Luxford will provide more information on the benefits of IGF1 in this workshop. Wiinsch *et al* (1998) considered the use of IGF1 in cross-breeding schemes.

3. *Graphical user interface.*

PIGBLUP version 4.00 now has an improved user interface, with greater support for use of the mouse, and graphical output.

Although there is now a graphical user interface, the program continues to run under DOS. The next stage in interface development will be to develop a true Windows 95 (Windows 98) interface at which point it will no longer be possible to run the programs from the DOS prompt. However, the program itself will:
- become more user friendly, as it will more closely resemble other applications that you use on your computer;
- make better use of the computer's available memory;
- directly access Windows' print facilities.

4. *Additional features.*

There are also some minor additions to the feature list. However, we recommend that producers only switch to version 4.0 immediately if they have a Pentium II based computer or require IGF1 analysis.

- It is now possible to choose to correct the performance traits for either weight or age. This enhances flexibility by making substitution of traits more feasible.
- Correction of performance traits for age or weight can be done separately for two time periods. For example, selection or a management change may alter the relationship between backfat and weight at some point in time; it then makes sense
  to make a different adjustment either side of this time point.
- Genetic groups can be specified for breeds. This allows breeders with small lines, which are tested together, to analyse the lines together. This provides more accurate evaluations than analysing each small line separately, via improved fixed effect estimation. This option does not allow for true 'multi-breed' evaluations taking account of heterosis etc - it assumes that the separate lines are still purebred.

- Most comments and headings are stored outside the program for future translation into other languages.

Features retained from previous versions.

5. *Multivariate evaluation of production traits.*

Lifetime average daily gain, average daily gain on test, feed conversion ratio, ultrasonic backfat, carcase fat depth, carcase muscle depth and lean percentage of the carcase are evaluated together.

6. *Univariate evaluations of reproduction traits.*

The reproduction traits number born alive and litter weight at 21 days of age are evaluated using univariate analyses.

7. *Calculation of a $INDEX value.*

Based on economic, production and marketing data supplied by the user, PIGBLUP calculates a single value for use in selection with appropriate emphasis applied to each evaluated trait. Alternatively, the user may provide his own index weights (which may or may not be economic weights).

8. *Genetic and environmental trends.*

Graphical representations of the trends in genetic improvement (free of environmental factors) and environmental effects (free of genetic differences) can be obtained from PIGBLUP.

9. *Mate selection module.*

Helps with mating decisions by assigning boars to sows to maximise the expected $INDEX EBVs of the progeny while, optionally, controlling the inbreeding.

10. *Genetic audit.*

PIGBLUP provides you with information to enable you to assess your current selection methods. This information covers selection differentials, inbreeding, generation intervals, average boar usage and a comparison of current with past rates of genetic progress.

What's next for PIGBLUP?

11. *Multivariate evaluation of reproduction traits.*

Number born alive (NBA), litter weight at 21 days of age (W21) and weaning to conception interval after the first parity will be analysed in a multivariate model. In addition, NBA and W21 in gilts are treated as separate traits to NBA and W21 from sows. This evaluation system takes account of information on all of the traits in predicting the EBVs, models the changes in relationship between traits across parities

and allows different emphasis to be placed on gilt and sow trait EBVs in the selection objective. This area of development will be discussed elsewhere in this workshop.

12. *Windows user interface.*

Interface development will continue with the goal being a true Windows front-end. This will make the program more accessible to users that are familiar with the interfaces of Windows applications. It will also provide access to other features of the Windows operating system, such as memory management and print facilities.

13. *Support of across-herd evaluation.*

In Europe, across-herd evaluations are commonplace, with nucleus herds within a breeding enterprise being linked by AI. Support of these evaluations will take the form of herd being accounted for in both genetic and management groups. Output summaries (eg genetic trends) will be available by herd.

14. *Additional traits.*

AGBU is involved in research projects which may identify traits which may be useful indicators of performance later in life (eg PrimeGro®) or in commercial environments. Any useful new traits will be incorporated into PIGBLUP.

15. *Use of genetic marker information.*

Molecular genetics is now producing information on identifiable pieces of DNA which are connected to the performance of animals. This information can be included in the PIGBLUP evaluation system to give more accurate EBVs. Genetic markers will be covered elsewhere in this workshop.

References

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